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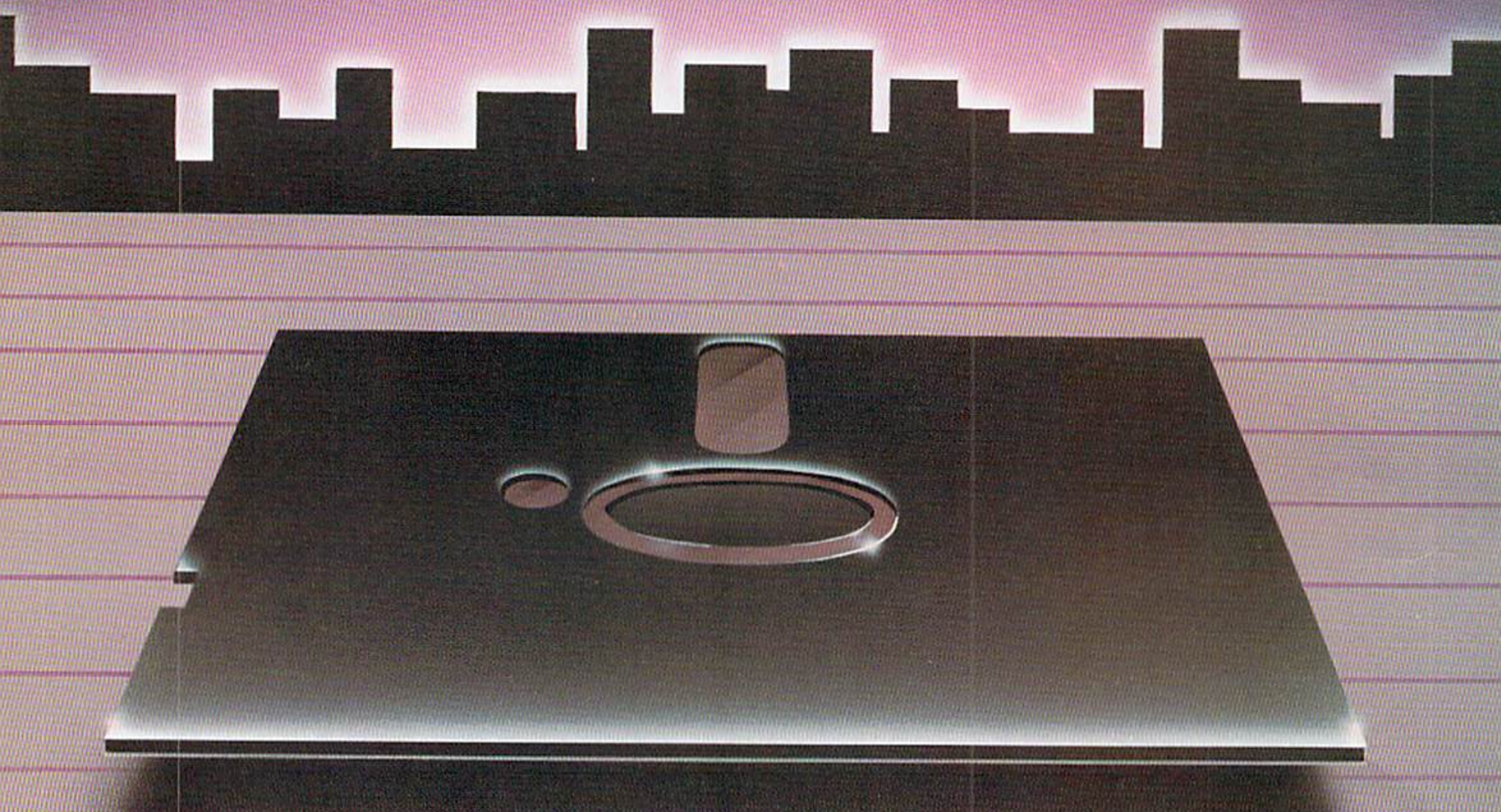


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FEATURES

*Includes program: *C-128 Startup*

**Includes programs: *Hi-Res Bit Map Draw, Save, and Load; Multicolor Draw, Save, and Load;* and *Koala to C-128 Convertor* (for the C-128)

***Includes program: *Alchemist's Apprentice* (for the 64, 128, Plus/4)

****Includes program: SPRITE (for the C-64)

PROGRAMS

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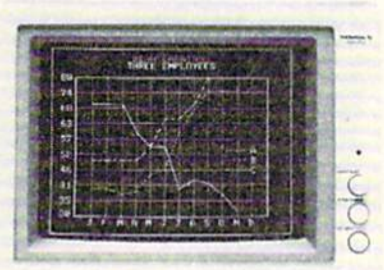
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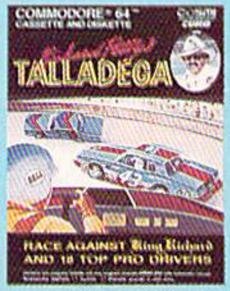
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VIEW FROM THE BRIDGE

The folk maxim that births and deaths come in pairs has never been better illustrated than by this issue of *Ahoy!* Our *VIC 20 Bug Repellent* has surrendered the space it's held for two years to a new C-128 version, providing a representation in microcosm of the direction *Ahoy!* is moving in.

While the VIC 20 will not totally disappear from these pages, the trend *Ahoy!* has been following these past months toward more for the 64 and 128 and less for the VIC will continue. This will anger the devout VIC users in our reading audience, but with a near total lack of new VIC products to announce and review and an ever decreasing trickle of original VIC program submissions, we couldn't continue to satisfy that small segment of our readership even if we tried. But we'll promise you VIC users this: send us a VIC program or article that's so useful, so innovative that we *must* publish it, and publish it we will!

As mentioned, *Ahoy!*'s C-128 coverage will continue to grow, as is witnessed by this month's lineup of 128-related features:

• Programming-wise, you're sure to become more powerful than the locomotive on this issue's cover once you learn the Escape sequence-accessed C-128 commands explained in this month's *Rupert Report* on *The Great Escape.* (Turn to page 18.)

• Some people love to talk movies. Some baseball. With Morton Kevelson, though, it's graphic bit-mapping. So it was only a matter of time before he turned his attention to *The C-128 Graphic Bit Map.* In addition to examining BASIC 7.0's graphic commands, Morton the K and Doug Bannon provide some multicolor and hi-res images and programs for manipulating them. (Turn to page 37.)

As for the other programs and features in this issue, some of which are 64-specific and some general:

• Last issue's *Commodore Roots* included BIGCHRS, a program for enlarging letters on the C-64 screen. Paul Montognese's *Bigprint* goes several magnifications beyond that routine, providing a full-featured environment for creating and utilizing large screen characters. (Turn to page 49.)

• *English Darts* recreates the famed pub pastime without the necessity of a flight to London. (Turn to page 60.)

• *Star Search* has drama, excitement, machine language speed, stellar graphics...everything but Ed McMahon. (Turn to page 54.)

• At first, Dead Man's Slope may seem all downhill. But as *Ski Folly* progresses, so does the steepness of the slope...and the speed at which you fly down it. (Turn to page 67.)

• Buck Childress, fast becoming one of *Ahoy!*'s most prolific contributors, provides *Free RAM Check*, which will investigate the areas of memory where many ML programs and subroutines reside. (Turn to page 35.)

• But the Buck doesn't stop there! You'll never want to program without *Failsafe,* a utility to automatically save your BASIC program every 15 minutes. (Turn to page 56.)

• In addition to providing a comparative review of four popular boxing simulations and a strategy guide to Epyx's Olympic Series, this month's *Entertainment Software Section* includes reviews of *Zorro, Ultima IV, Heart of Africa,* and other new releases. (Turn to page 41.)

Cheryl Peterson illustrates some programming fundamentals with the aid of *Alchemist's Apprentice,* a children's game for the C-64, C-128, or Plus/4 included with this month's *Cadet's Column* on *More BASIC Programming.* (Turn to page 79.)

The SPRITE program presented this month as part of *Commodore Roots* has nothing to do with the column's theme: *The Musical Commodore.* But Mark Andrews promised it last issue, and he's a man who keeps his promises. (Turn to page 85.)

As usual, there's more inside than we have room to mention on this page. We're sure that's the way you want it. One final note: the *Ahoy!*/PlayNET subscription offer has been repeated due to popular demand. But act soon! Details are on page 75. *—David Allikas*

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AMIGA GRAPHICS AND PROGRAMMING SOFTWARE • C-128 CABINET • HARD DRIVE • GAMES FROM SSI, ELECTRONIC ARTS, CYGNUS • SAXOPHONE PROGRAM • SPARTAN APPLE EMULATOR • CP/M SOFTWARE • BOOK OF C-128 GAMES • MICE • MICRO TOOLKIT • ANSWERING MACHINE

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The Cardco Hard Disk Drive, available in configurations of 5 ($599.95), 10 ($899.95), or 20 ($1299.95) megabytes, boasts an operating speed of 50 to 70 times that of the Commodore 1541, expanded Commodore DOS, and total transfer of copy-protected programs. A one-button command records any program (copy protected or not) loaded from floppy disk, cartridge, or cassette onto the hard disk, where it will be at your immediate disposal (a full-function spreadsheet, for example, loading in under three seconds). At press time, shipment of C-64 models was scheduled to begin by early April, with the C-128 version to follow shortly.

Cardco, Inc., 316-267-6525 (see address list, page 122).

COMPUTEREYES/NEWSROOM

Digital Vision's *Newsroom Compatibility System Software* will enable users of their Computereyes video acquisition system (see review in September '85 *Ahoy!*) to convert captured images to a format usable by Springboard's *Newsroom* program, making it possible to incorporate photos into *Newsroom*-rendered newsletters and announcements. The new software will also convert standard hi-res images from other programs to the proper format.

This latest release joins the other software enhancements available for use with Computereyes, each available on disk with user's manual for $15.00. They include the *Print Shop Compatibility System Software* and programs supporting the graphics modes and image formats of *DOODLE!*, *Koala Pad*, and *Flexidraw Pen Palette.*

Digital Vision, Inc., 617-444-9040 (see address list, page 122).

SAX EDUCATION

Joining the previous releases in the Mastery in Music Band Series *(Flute, Clarinet,* and *Trumpet), Saxophone Master* ($49.95) offers an alternative to drill and practice with music personalized by the user's choice of key and time signature, note type, and range, as well as providing scales, thirds, and intervals in major keys. An 80-page manual included with each installment in the series supplies a description of the parts of your instrument, basic music facts, program instructions, lessons, and an appendix. Additionally, a printer option generates hard copy references.

MasterSoft, 503-388-7654 (see address list, page 122).

OCTOPUS'S PROGRAM

The *Octopus* hi-res screen print program loads and prints pictures from a variety of drawing packages, providing the user with full control of the printed patterns and colors. The software works with the C-64 and Okimate 10 or Okimate 120, or the Okidata 92/192 with Cardco's +G or G-Wiz or Tymac's The Connection interface. Included on the disk are three hi-res pictures for immediate use. Price is $16.75 plus $2.00 postage.

Omnitek Software, 414-694-4400 (see address list, page 122).

BOOK OF 128 GAMES

35 Amazing Games For Your Commodore 128 provides ready-to-type listings of arcade, board, and educational games written in BASIC 7.0 specifically for the 128. Suggestions are provided for altering speed, difficulty, colors, sounds, etc. Price of the 120-page paperback is $9.95 plus $1.95 postage.

HPBooks, 800-528-4923 (see address list, page 122).



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PAPER CATCHER

The price of Buddy Products' Paper Catcher, seen in the June '85 *Scuttlebutt*, has been lowered. Model 9657, which perches atop a variety of 80-column printers and stacks printouts, has dropped from $49.95 to $29.95; Model 9658, for 136-column printers, from $59.95 to $39.95.

Buddy Products, 312-733-6400 (see address list, page 122).

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Batteries Included, 416-881-9941 (see address list, page 122).

Commodore is offering a 25% discount to college students and faculty members on the purchase of an Amiga, 1080 color monitor, and 1050 256K RAM expansion cartridge (combined suggested retail price $1985).

Commodore International, 215-431-9100 (see address list, page 122).

C-64/128 MICE

Winner, the maker of a line of arcade style joysticks, has added a pair of mice to its product line. *Mighty Mouse* will work with the C-64 or C-128, and is compatible with most programs. *Magic Mouse,* compatible with the C-64 and most of its programs, is designed for creating hi-res graphics, sprites, and icons. Each mouse carries a one year warranty.

Winner, c/o Contriver Enterprise Co., Ltd., 604-251-9925 (see address list, page 122).

AMIGA UTILITIES

Now available are six packages for Amiga programmers previously announced by Lattice, Incorporated:

Lattice Text Utilities, a set of eight programs providing a language-independent set of tools for examining and editing text files.

Lattice Make Utility, allowing us-



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ers to rebuild complex systems with a single command.

Lattice Screen Editor, providing a multiwindow environment with standard editor functions as well as special features like an error tracking mode, three assembly language input modes, and pattern searches.

Lattice dBC III Library, containing more than 70 C language functions for creating, accessing, and updating dBASE III-compatible files.

Panel, a screen design/management tool permitting programmers to use custom data entry validation and pop-up help messages and menus.

Lattice MacLibrary, supplying over 60 C language functions that aid in implementing screens, windows, and gadgets.

Also available is *Unicalc* ($79.95), a spreadsheet providing a 256 column by 1024 row processing area, context-sensitive help screens, and dual window capabilities, plus floating dollar signs, negative balance indicators, integrated functions, and punctuated numbers.

Lattice, Incorporated, 312-858-7950 (see address list, page 122).

C-128 CABINET

The C-128 Command Center is a cabinet providing protection for one or two disk drives, the CPU, and all necessary cables, and matching the C-128 in color, texture, and style. A built-in power strip protects the equipment from line surges and voltage spikes; a built-in fan keeps the drives and CPU cool. Price is $159.95 plus $3.50 for shipping and handling.

ICCCI, 319-338-7123 (see address list, page 122).

BASIC HANDBOOK

The third edition of *The BASIC Handbook* ($24.95), in print since 1978, has been released. The 862-page volume functions as a dictionary of over 800 words, an encyclopedia, a thesaurus (for alternates when BASIC will not allow a specific word), and a translation guide for converting programs from one BASIC dialect to another. Examples and demo/test programs illustrate us-

age and results.

CompuSoft Publishing, 619-588-0996 (see address list, page 122).

SPACE PEN

Watch for a dramatic drop in the price of the Space Pen input device announced in the September '85 *Scuttlebutt.* The light pen which detects a "Z" axis, permitting operation in a six foot area in front of the computer screen, had been selling for $150 (C-64/VIC 20 version) and $175 (Amiga version). But by integrating the electronics on a chip, the manufacturer tells us, he will be able to begin wholesaleing the package within the next six months for around $10.00. What your final cost will be remains to be seen, but there's a good chance that you won't even have to buy the pen—that it will be offered "free" along with third party software developed for it.

Soniture, Incorporated, 408-866-4616 (see address list, page 122).

GAME RELEASES

Five new C-64 releases from Strategic Simulations:

Nam ($39.95) allows you to lead a unit of U.S. Marines in one of six action scenarios: in the air, underground, against a defended position, in ambush, with armor, and building to building. Tactical elements available include civil police units, South Vietnamese and Korean infantry, paratroopers, rangers, and air cavalry, along with their attendant vehicles and support weapons. The computer directs the enemy on one of three difficulty levels, forcing you to deal with such military concepts as concentration of force, cover fire, and flanking and selective maneuver.

BattleGroup ($59.95), the sequel to *Kampfgruppe,* follows allied armies fighting Hitler's forces through every major engagement from North Africa in 1943 through the war's climax in Germany, positing you as the leader of American or British regiment- or brigade-sized forces opposed by like numbers of Nazis. Four historic scenarios are included; in addition, the player can create an infinite number of original ones. You can play against a human opponent or the computer, or let the computer play itself in one of the four historical modes.

Wargame-type strategies are combined with fantasy game elements in *Wizard's Crown* ($39.95), in which you lead a band of adventurers to recapture said headpiece from behind spell-woven walls in the once-splendid city of Arghan. You create individual characters by selecting from among personality traits, attributes, skills, and a nearly infinite variety of semi-randomly created magical items. With your companions, you fight battles against more than 20 kinds of monsters, in single or party combat, forming lines, advancing, and retreating.

Once you've bagged the crown, you can start looking for the missing *Rings of Zilfin* ($39.95), and fighting the forces of Lord Dragos, The Dark One, to save the people of Batinig. You must make your way through dozens of villages and towns, utilizing spells, magic plants, assorted swords, bows, and armor, along with sundry mundane and mysterious objects. While you search and fight, clues are revealed that must be dealt with in cause and effect relationships.

Phantasie II ($39.95) takes you to the Isle of Ferronrah, beset by evil power emanating from the enchanted Orb of Nikademus, the Dark Lord. You and your companions must invade difficult terrain, escape dungeons, and defeat monsters (chosen from over 80 types) to rid the land of both orb and lord. Additional features include new terrain elements such as dangerous molten lava, near-impenetrable mists, and haunted dark voids.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 122).

Tales of the Unknown: The Bard's Tale ($39.95) combines color animation with 16 levels of mazes, combat, magic, and puzzle-solving. You must vanquish Mangar, the evil wizard (can you stand one more?) who has cast an eternal winter spell on the town of Skara Brae. To this end, you assemble up to six alter ego characters, outfit them with armor, weapons, and magic items, and lead them

through increasingly complex and challenging mazes. Four types of magic are employed: conjuring (for creating objects and healing adventurers), magic (for bestowing special effects on common items), sorcery (for creating illusions and heightening awareness), and wizardry (for summoning and controlling supernatural creatures). The two-disk game for the C-64 will retail for $39.95.

Electronic Arts, 415-571-7171 (see address list, page 122).

Championship Golf at Pebble Beach ($24.95 prepaid; $27.95 C.O.D.) lets golfers tee up on the Pebble Beach Golf Links, graphically recreated with bird's-eye views of tees, fairways, greens, sand traps, trees, and the Pacific Ocean. A joystick or the keyboard is used to produce a variety of different shots including hooks, slices, and chips. Features include variable tee placements and pin positions, scorecard printout, and choice of 14 clubs. Closeup views of each green are provided during putting. Data disks from courses such as Augusta National and the Tournament Players Club can also be purchased.

Sportsware, 415-960-6674 (see address list, page 122).

Farm Life simulates an ultramodern farm, where you must buy and sell cattle, crops, and machinery. One to four players compete against one another or the bank. Price of the C-64 program is $12.00, including shipping.

Tidal Bore Software, 902-895-4563 (see address list, page 122).

Three new C-64 offerings from Cygnus include *Star Fleet I* ($49.95), a translation of the two-year-old IBM PC game; *Quizam!* ($39.95), a trivia contest; and *Stinger!* ($19.95), a space arcade game for younger players. An Amiga version of *Star Fleet I* is planned for this summer (along with *Balakon Raider* and *Spinout* for the C-64), and *Star Fleet II* for the C-

Cygnus Software, 713-486-4163 (see address list, page 122).

AMIGA GRAPHICS SOFTWARE

The following from Aegis Development, intended to exploit the Amiga's graphics capabilities:

The *Aegis Images* paint program allows the use of 32 colors at once and features spread and wash options, color blending, adjustable airbrush, customizable paint brushes, and tile drawing.

Aegis Animator allows the use of any *Images* picture as a backdrop for an animated sequence, plus path plotting, storyboarding of up to nine separate animations, clone and destroy, movement on X and Y axes for a 3D effect, full rotation, and proportional sizing.

Images is priced at $79.95; *Images* and *Animator* together at $139.95. Both programs are for use with 512K.

Impact allows the business or scientific professional to display numeric data in bar, line, or pie chart format. Bar charts can be either horizontal or vertical, and 3D. Line graphs include both single and multiple plots in regular, area, and scatter formats. Pie charts can have exploded segments, with a 3D option. Slide show capabilities control the type of transformation used between slides (fade in/out, spiral, curtain up, etc.).

At press time, it appeared that *Aegis Draw* (under $200) would not be ready in time for inclusion in Morton Kevelson's comparative review of CAD (Computer Aided Design) programs scheduled for next issue. Which is unfortunate, because prepublicity for the package (see ad last issue) indicates that the program actually does what the C-64 and C-128 CAD packages are trying to approximate. In fact, already in the works is *Aegis Draw Professional*, to which users will be able to upgrade and utilize features not found on other microcomputer CAD systems.

Aegis Development, Inc., 213-306-0735 (see address list, page 122).

LABEL MAKER

Disk Label Maker ($12.99) allows the user to read and print labels from the disk directory, and to modify any entry (including the header) before printing. Expanded and condensed print modes are supported, and names up to 54 characters long can

be used. C-64 and C-128 versions are on the same disk.

Mavenware, 907-789-1783 (see address list, page 122).

CP/M SOFTWARE

Out-Think ($49.95) lets C-128 owners running CP/M Plus classify text into an outline structure, then alter and access the text based on that structure. Levels of the outline can be collapsed off the screen, hidden from view, and then expanded back into view for editing. Complete copy and move operations are provided. Outlines can be printed with over 20 different formatting parameters, including headers and footers and an automatic table of contents.

Current owners of Kamasoft's *Kamas* outline processor can obtain *Out-Think* by sending in their *Kamas* master disk and $25.

Kamasoft, Inc., 503-649-3765 (see address list, page 122).

Disks of public domain CP/M software are available for $15.25 each from Poseidon Electronics. To receive a catalog send a stamped ($0.39) and self-addressed envelope and $1.00 to Poseidon (see address list, page 122).

TELECOM NEWS

The good news is that Commodore is giving away a free 1660 modem (retail $49.95) and QuantumLink software (see review last issue) with the purchase of a C-128. The bad news is that it may already be too late for you to take advantage of this offer, which ends March 31.

Commodore International, 215-431-9100 (see address list, page 122).

The aforementioned QuantumLink has enhanced its Commodore Information Network to include a Commodore Hotline, permitting the user to send questions to Commodore or browse a database of frequently asked questions on the 64, 128, and Amiga; a User Group Center, listing authorized groups and providing a forum for user group officers and members, along with special bulletin boards set up by more than 50 user groups; Meet the Press, enabling users to exchange messages with leading experts; and SYSOP Corner, providing weekly columns by each of Q-Link's SYSOPs.

Quantum Computer Services Inc., 703-448-8700 (see address list, page 122).

Microsearch, a database devoted exclusively to microcomputer products, is now available on CompuServe. Updated biweekly, the database contains over 28,000 product summaries and computer magazine reviews of more than 12,000 products. Users can search by keyword, publication, title, author, date, computer, operating system, or manufacturer. A directory of 5,000 manufacturers' names is provided.

Microsearch Information, Inc., 202-833-1174 (see address list, page 122).

PIRATE TO WALK PLANK

Be forewarned, those of you who think the FBI is too busy tracking master criminals to concern itself with folks who merely dupe software for fun and profit. That esteemed government agency has informed us of the arrest of Raymond Paul Johnson for copyright infringement in violation of Title 17, United States Code, Section 506A. The possible penalty for the accused software pirate's piddling crime? A fine of up to $250,000 or imprisonment for up to two years. His is one of many arrests to be made in months to come. Please don't get your name in *Ahoy!* that way.

AMIGA ANSWERING MACHINE

The Amiga 1100 AnswerMate, a programmable answering machine, hooks up to the Amiga's RS-232 port and is put in series with the telephone. The unit contains a computer-controlled audio cassette mechan-

ism for recording voice messages from the telephone line, or voice messages generated by the Amiga's built-in text to speech capability. A touch tone decoder is provided for beeperless remote control; Hayes-compatible Bell 212A modem is available at extra cost.

Commodore-Amiga Inc., 215-431-9100 (see address list, page 122).

DISK CARE BOOKLET

The Floppy Disk Story, a free 32-page booklet, introduces children to the use and care of diskettes through the illustrated adventures of Ralph and his buddy, P.C. Poindexter. A free copy (one per household) can be obtained by writing to the Fuji Film Promotion Department (see address list, page 122).

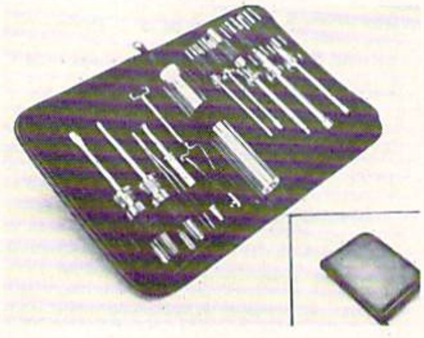


Free Fuji booklet teaches disk care.
READER SERVICE NO. 220

MICRO TOOLKIT

As most adventurous Commodore users discover after their first misadventure, opening your hardware and attempting a repair is an activity best left to qualified personnel. But if you're in that category, as a large percentage of *Ahoy!*'s readers are, the PC Tool Kit provides 11 implements commonly used in do-it- yourself repairs, some designed especially for use with microcomputers, packaged together in a zippered case. Price is $29.95.

MicroComputer Accessories, Inc., 213-641-1800 (see address list, page 122).



11 implements for computer repair.
READER SERVICE NO. 221

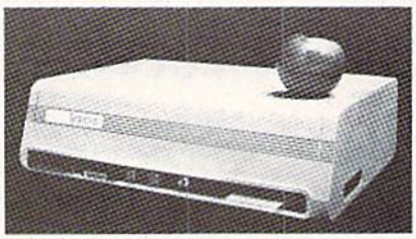
ANCIENT SPARTAN

We reported on it for the first time in our February '84 issue, at which time we assumed that the Mimic Systems AP Modular Pak would soon see release. It was the most exciting new product to be announced in some months: a hardware addition that would allow all Apple II-compatible software to run on a Commodore 64. In the more than two years that followed, the project changed ownership, the device was rechristened the Spartan, and hundreds of thousands of dollars worth of full-page ads appeared in major computer publications (ours included). But between our February 1984 issue and last month, not another word about Mimic Systems' Spartan had appeared in *Scuttlebutt*—because it still had not been released.

In the home computer market, we are of course used to products being announced and/or advertised months before they actually come available. But the Spartan has in its two and a half year non-life transcended the classification of "vaporware" into an industry joke. Still, the great gobs of money Mimic Systems continued to spend on advertising left no doubt in our minds that they meant business. After more than a year of fine tuning, Mimic invited *Ahoy!*'s editors to their suite at the January '85 Consumer Electronics Show, where a working model was on display. Shipments would begin, we were told, very shortly. Twice during the following year, the company's PR agency called to tell us that an evaluation unit would be sent in a matter of weeks. You guessed it—nothing.

Until last month's West Coast Commodore Show in San Francisco, where boxed Spartans were on display and Mimic's Peter Ho informed us that shipments had at long last begun (as of early February). While neither you nor we may ever know the true cause of the product's record book delay, we *can* provide you with the Spartan's current technical specifications.

The system is Apple II+ software- and hardware-compatible. The manufacturer does not claim full compatibility; in fact, on the press release we received, "100%" is crossed out in both cases.



Spartan: II+ emulation, II+ year wait.
READER SERVICE NO. 222

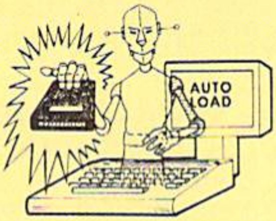
Included are eight Apple II+ compatible decoded peripheral slots and four software selectable C-64 cartridge slots, one non-dedicated 8-bit parallel port with flag registers and command word, and one standard

Continued on page 122

AUTO LOAD

Tired of typing load commands over and over? Here's a cartridge based program that will solve all your loading needs. Holding down different keys automatically loads and runs programs along with a one button loading of the directory!

- Get a menu selection of the disk by just turning the power on
- ANY commands normally typed can be put into an automatic Power up file
- Works with multible disk drives!
- Great for Programmers who load several utilities in a row
- Comes with built in system reset switch
- Easy for kids who can't type yet



ONLY $19.95

D-CODER

- Translates any machine language program into easy-to-ready English descriptions with complete explanations of each command
- Makes complete notations of all important memory locations accessed by the program (SID, VIC, MOS, KERNAL, etc.)
- Gives you three ways of accessing programs:
  1. **Will read and list programs from DISK**
  2. **Will read and list programs from MEMORY**
  3. **Direct user input (from magazines, etc.)**
- Can be used to locate and examine any machine language program's protection routines!
- Can be used to easily break apart machine language programs for study and examination!
- Printer option for complete hard copy listings!

You no longer need to be an EGGHEAD to read Machine Language.

$19.95

N-CODER

THE PERFECT COMPANION PROGRAM TO D-CODER!

Allows you to easily make changes in machine language programs . . . right on the disk!

- Rewrite ability allows code to be altered and then rewritten directly to the disk!
- Features sector-by-sector scrolling assembly language display of machine language programs!
- Notation of ASCII text equivalents for easy spotting of embedded text strings!
- Handy reference display of all assembly language commands and their ML numerical equivalents!
- Byte splitter for easy splitting of decimal addresses into low byte-high byte format!

$19.95

Top Secret Stuff I and Top Secret Stuff II

Programed by Jim Drew

Are both collections of 20 programs per diskette (that works out to about $1.00 per program!) that help you explore and enhance your Commodore 64 and/or 128 and 1541 disk drive. Now you can unlock many secrets formerly known only to top machine language programmers by using these sophisticated "tools." If you have ever been curious about the inner workings of your computer system, now is your chance to dig in and find answers with the help of these programs. These collections of programs have gotten rave reviews from actual users, and we are sure that you, too, will be pleased.

These are just some of programs included.

TOP SECRET STUFF I

The Dock (view/repair disk contents)
Sync Checker (diskette)
Disk Manipulation System
Diskette Matcher (compare sectors)
½ Track Reader
Electronic Arts Backup
Drive Mon (disk drive m/l monitor)
Diskette File Log (start-end address)
Repair A Track (recover data)
½ Track Formatter

$19.95

TOP SECRET STUFF II

RAM Test (test Computer RAM)
Copy $A000-$FFFF (under ROMS)
Display G.C.R. (All sector data)
Smooth Scroll (messages up screen)
Koala Dump (koala pad screen dump)
Disk Protection System (stops copies)
Boot Maker (autobook BASIC programs)
Wedge - $C000
Diskmatcher II (high speed version)
No Drive Rattle (on reading errors)

$19.95

TAX PAC

Tax preparation has never been a breeze except when you let your computer do it for you. This easy to use menu driven program follows your tax form line by line while computing all the necessary information. It has all the tax tables included for the forms listed below and will print out all the information you need to fill out your forms. Tax Pac reduces that chance of error in order to get that refund Quick!

- Tax Forms Supported: 1040, 1040A, 1040EZ, 2106, 2441, 4562, 3468, 941 and Schedules: A,B,C,D,E,G,SE,W
- Stores all your tax information on disk for easy recall or recomputation.
- Does all computations and prints all the figures you need to fill out your official forms.

Purchase price is tax deductible $24.95

GRAPHICS AND GAME DISK

A stimulating x-rated adventure game, complete with graphics representations. This is not your typical adventure game. FEATURES ANIMATED X-RATED CARTOONS.

*Joystick required

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WAR GAMES AUTODIALER

1. **Auto Dial** will automatically dial a set of numbers you choose.
2. **Review Numbers** will review numbers that were answered by a computer
3. **Save Numbers** will save numbers where a computer answered
4. **Hardcopy of Numbers** will print out list of numbers where a computer answered
5. **LOAD Numbers** will load in numbers to continue where it left off
6. **Continue** will pick up dialing where it was interrupted



$29.95

SOFTWARE PROTECTION HANDBOOK

4th Edition!

SOFTWARE PROTECTION HANDBOOK Fourth Edition! Now Available!

If you're **tired** of being harassed by **protected software** and too many **copy** programs, then this is the book for you! This 250 page manual covers the gamut from legalities to protection methods to step-by-step back up procedures. Now you can learn both how to **protect and unprotect** software! The techniques covered include copying cartridges to tape or disk, tape protection, and disk protection. Disk protection covers error numbers 20, 21, 22, 23, 27 and 19 **plus** single track formatting, header modification, header swapping, half track reading and writing reading and modified bit densities, formatting illegal track/sectors, sync writing and **more!** Forth addition contains the most unusual and innovative protection analysis tool for the Commodore yet! - **not for Beginners** - This system expands your 1541 drive giving capability otherwise only possible for **professional** disk duplication equipment, now you can create or analyze exotic forms of disk protection. **'D.O.S. Kings' Take Note!** - Entire tracks of data can be read and written without regard to 'standard' sync and format. You are no longer limited to sector by sector searches. Whole track readouts reveal hidden data even when all or most of the sectors have been erased. Uncovers and writes data under errors, pulse coaded sync or data, hidden data and access codes, multiple track densities and more! This manual covers the complete implementation of the track trap system including necessary software and hardware documentation.

C-64 Book Only .... $19.95 US

Book & Disk of all Programs .... $29.95 US

This manual does not condone piracy

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FAST RAM

• Powerful all machine language program. • Takes up only 4K of memory.
• Adds 10 new commands plus and advanced DOS wedge

Store programs or sequential in Ram for almost instant access. This gives you the advantage of having several programs in memory at the same time.
Imagine writing a game and having a sprite editor program in memory at the same time!

ONLY $19.95

PHOTOCOPY

A utility to convert several different graphic pictures over to the NEWSROOM format. This program will convert the following.

Hi-res Doodle, screen magic, flexidraw, and graphics basic.

Also converts 8K bit mapped hi-res file such as Screen Magic, and Flexidraw.

Improve your NEWSROOM library.

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DIR+
A DISK LIBRARY CATALOGING PROGRAM

Having problems finding that lost disk? Here's a program that allows you to alphabetize and print out your program names in a versatile format. A scrolling arrow allows you to edit out meaningless names and keep what you want. Know what you got and where its at!

- 60 to 600 titles (1 to 5 COLUMNS) can be printed per page by using optional condensed printing.
- Print disk labels with your disk names and ID's.
- Can support up to 1100 program titles and can alphabetize in less than 15 seconds!
- Save the master list to disk for use with a word processor or a data base.

ONLY $19.95

TOOLBOX 64 AND NEW TOOLBOX 128

Side 1 contains over 100 routines, some of them are for protection, smooth scrolling, modem routines and sound and color. Also a bootmaker, paddle and joystick test; read terminal, and auto dial and auto answer. Documented routines allow you to use them to build your own programs or use alone. This disk has a lot of tricks that are used in commercial software.

Side 2 contains several of the same routines for the 128 system but also a T&S editor for going out to track 66, along with a screen dump for the 80 colum mode and lots, lots more.

Side 1 C-64 **Side 2 128** All for $19.95

64-128 CROSS REFERENCE BOOK

This is the first book available of its kind. Complete cross-references used to covert 64 programs over to the 128 computer. Book is formated on the left side with the location and label name, and then on the right with the equivlent 128 location. The entire range of memory is covered starting at 0-Page going thru BASIC and then thru the Operating System. A must for the serious 128 user.

$12.95

64 BBS

Full performance boards with lots of extra's not found on others. Both boards have message rooms that can be setup for a variety of different uses. Each room can have it's own access level assigned for maximum control.

- 7 read and write rooms with up to 8 secur ity levels
- Public message base and sysop's mail box
- Secret highest level for complete access of all functions
- Auto cycling of E-mail.
- Remote access for system operator. Boards activity can be sent to printer.
- 300/1200 baud selectable
- Up and down file transfers with a choice of access levels.
- New punter and X-modem protocol supported.

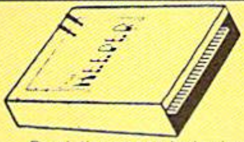
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128 BBS

This is the first complete 128 bulletin board of it's kind. All the features of the 64 board and more. The board takes advantage of the extra memory by providing a complete seperate sub-board. User can have both boards available at the same time. Imagine running an open board for everyone a secret closed board for the more serious users. Look at these features.

- Print out boards activity to include what files accessed and by who.
- Faster performance and more storage using the 1571 drives.
- Supports the use of over 500 users!
- Both boards will support and work on any type of disk drive including the big 1 meg. SFD's.

$39.95



NEW FOR C-64 and C-128
THE KEEPER

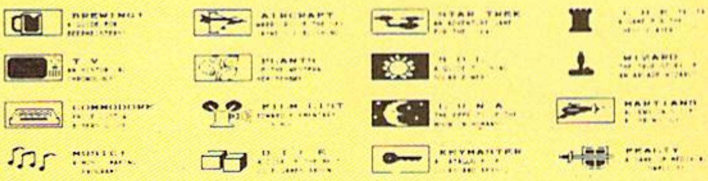
Revolutionary new technology enables virtual storage of 8192 bytes of high speed RAM. With write protect and in/out switches, the KEEPER adds new dimensions to your computing capability. Designed for the Commodore C-64 and C-128.

- Makes Auto-Start Cartridges of Your Own Programs
- Built-in Software Makes Use EASY
- Copy BASIC or Machine Language Programs
- Instant Program Recall
- May Be Used Over and Over
- Guaranteed for 1 Year

ONLY $39.95

GRAPHIC LABEL MAKER

Give your labels the professional touch. With Hi Rez Graphics make your own design or use one our 60 premade labels with easy to use on screen editor. You can insert up to three lines of text then choose the picture you want to put on the left hand side of the label. Then you can print out as many labels as you want. This has got to be the neatest label program out there and it's only $24.95



Now works with Print Shop

Also available — the x-rated Graphic package for the 64 and your print shop. There's 60 Hi Rex pictures

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1541 M.A.S.H.

Now you can service your own 1541 disk drive using 1541 M.A.S.H. Save big bucks on repair bills. Rate the performance of your drive. Test and adjust RPM's. Test and adjust head alignment. Step by step instructions that anyone can follow. Pays for itself the first time you use it to adjust a misbehaving drive. No knowledge of electronics is necessary. All you needs is a screwdriver and 20 minutes.

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128 80-COLUMN ADAPTER

An adapter that plugs into your RGB output that gives you 80-columns of monochrome text in the 128 mode.

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THE MECHANIC

A collection of Programmers utilities for the Commodore-64 enthusiasts. Included are Programs which will allow you to make your 64 do things it did not do before. Four major utilities are listed below but contains more!

- **FULL FEATURED TRACK AND SECTOR EDITOR** - Display can be changed to readout in ASCII, HEX or Decimal, also a directory can be listed within the Program!
- **FILE MAINTAINER** - A menu driven section featuring a scrolling file selector to copy multible files without typing all the names in. Also included is a file renamer, scratcher and file locker and unlocker.
- **ML MONITOR** - A complete monitor with easy to use commands along with some extra features not found on some. has the ability to do a directory within the monitor and send drive commands.
- **POWER SORT** - A unique sorting program that allows you to pull in the directory, sort it alphabetically or by size and then store it back on the disk!

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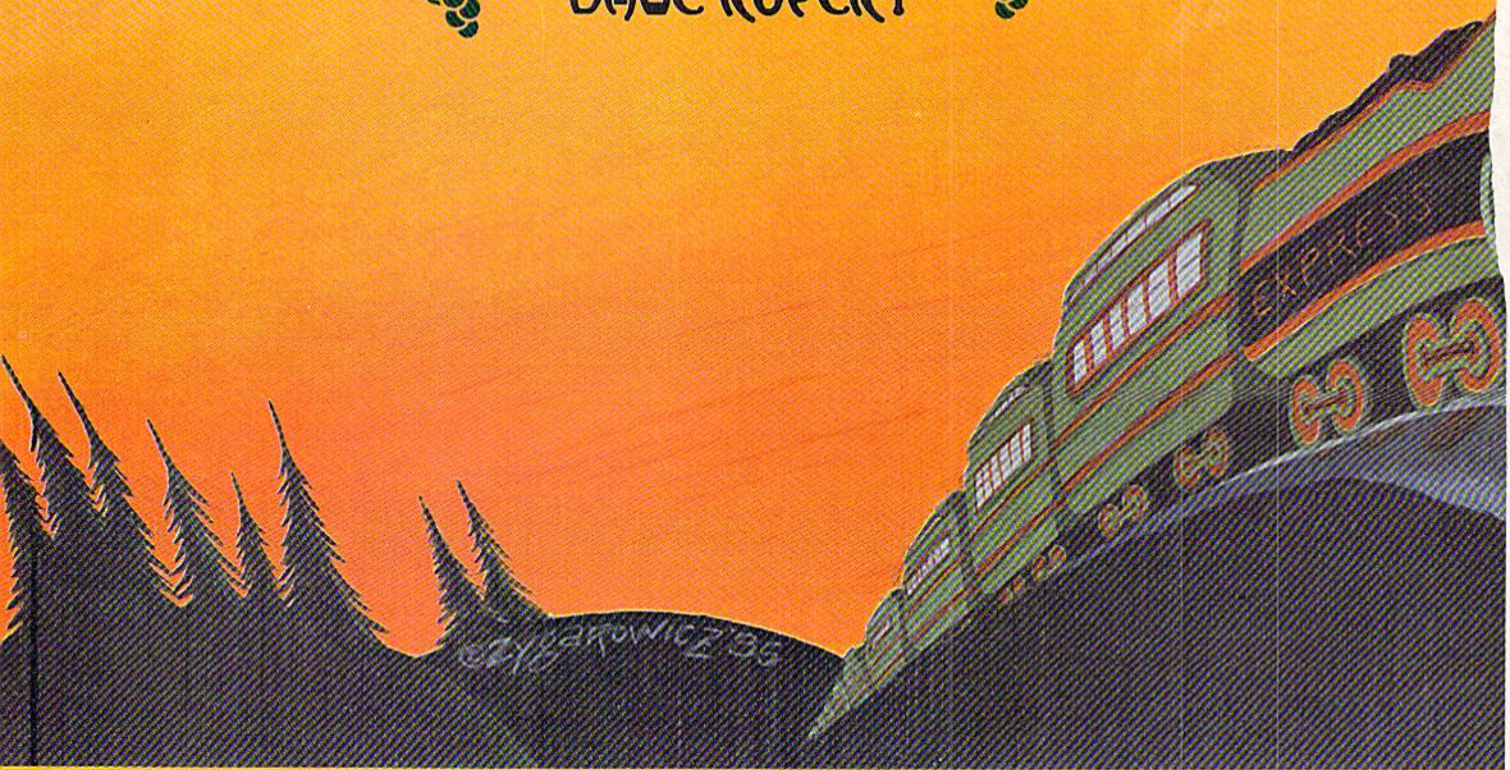
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THE GREAT ESCAPE

Using Escape Codes on the Commodore 128

BY
DALE RUPERT



The Commodore 128 provides a very nice environment for creating and editing programs. The disk commands are built into BASIC 7.0, so there is no longer a need to type horrendous sequences of keystrokes to look at a directory. The function keys are programmable "on the fly." The 80-column format allows just the right amount of information to be present on the screen at one time. The No Scroll key is worth many times its weight in gold.

All Commodore computers since the VIC 20 have provided a screen editor. The ability to move around at will on the screen, inserting and deleting as necessary, is an incredibly powerful feature. (Probably only those who have used a line editor can fully appreciate the significance of a screen editor.)

The Commodore 128 adds some useful and powerful commands to facilitate programming and editing. Those commands are accessed by means of Escape sequences. This month we will investigate the Escape sequences and see how useful they are.

The concept of an Escape sequence may not be new to you if your printer accepts this type of special control code. The Escape character has an ASCII value of 27. Many printers are programmed to interpret a character 27 as the first of a two-byte instruction, rather than as text to be printed.

For example, if an Epson printer receives a character 27 (Escape) followed by a character 69 (E), it does not print the letter "E". Instead it treats the sequence "Escape-E" as a command to enter the "emphasized print mode."



T.J. ZYGAROWICZ

The Escape sequences on the C-128 are similar in concept to those on a printer. Pressing the ESC key does not display a symbol on the screen. The key pressed after the ESC key determines what action is to be taken. The symbol normally associated with that second key is not displayed on the screen either.

In direct mode, Escape sequences are generated by first pressing then releasing the ESC key, followed by pressing then releasing a second key. The second key may be the "@" key or any of the letter keys "A" through "Z". Thus there are 27 Escape sequences available in the C-128.

COMMAND CATEGORIES

The Escape sequences or commands may be separated into three general categories. There are commands to (1) change the quote and insert modes, (2) affect the appearance and function of the screen, and (3) help with the task of editing.

The table on page 23 lists the commands in these categories. The Escape sequences are listed alphabetically on page 88 of the *C-128 System Guide,* and they are grouped in Appendix I. Note that in both places the descriptions of Escape-C and Escape-D are incorrect and should be swapped.

We will discuss each command in the order presented in the table below. Many are self-explanatory. A few have some side effects which we will describe.

DESCRIPTIONS

How often have you needed to insert text into the mid-



New toll free number:
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KEY MASTER

One of the easiest-to-use, most powerful disk backup program ever written for the 64. Working with the 1541 or the 1571 KEYMASTER is like getting two copy programs for the price of one. Its main feature comes with 50 keys that unlocks protected disks by ELIMINATING the protection scheme originally written on the disk.
Once one of the KEYMASTER'S KEYS has unlocked a disk, the program can generally be **FILE COPIED** onto another disk (also making the program compatible with non-1541 drives.)
In addition to the UNLOCKING KIT it contains a powerful yet easy to use general purpose copier for the programs not listed as a key.

With One 1541:
- **FAST** FILE COPIER - up to 5 times faster!
- **FAST** full protected - disk GCR nibble copier works in only 75 seconds!
- **FAST** full unprotected - disk copier.
- **FAST** 10 second disk formatter.

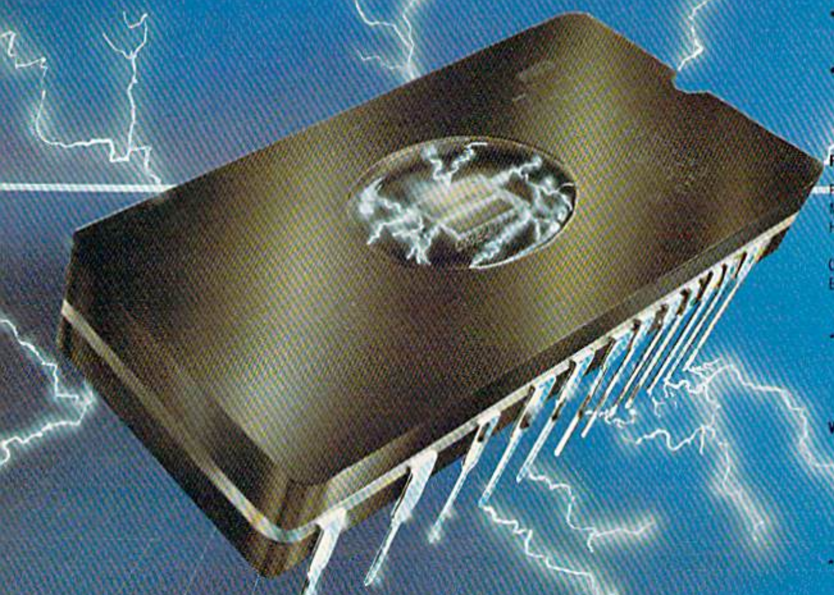
With Two 1541:
- **FAST** file copier - up to 6 times faster!
- **FAST** full protected - disk GCR nibble copier works in only 37 seconds!
- **FAST** full unprotected - disk copier.

•• **50 KEYS** for popular programs will be provided on the first KEYMASTER disk. Frequent updates of 25 to 50 additional KEYS will be available periodically. (No original disk return required for updates!).

ALL OF THIS AT THE RIGHT PRICE! ONLY —

$29.95 for KEYMASTER
$10.00 for update disks

KEYMASTER created by Jim Drew.



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MAGNUM LOAD BLOWS THE OTHERS AWAY!

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- Now you can give your 1541 disk drive "1571 speed."

The chart below compares ACTUAL MEASURED loading times.

PROGRAM	STAR DOS	REGULAR LOAD	MACH 5	FAST LOAD	MAGNUM LOAD
Pitstop II (EPYX)	?	144 sec	43 sec	41 sec	31 sec
Music Shop (BRODERBUND)	?	105 sec	105 sec*	105 sec*	21 sec
Hitchhiker's Guide to the Galaxy (INFOCOM)	?	70 sec	70 sec*	**	68 sec*
On-field Football (GAMESTAR)	?	159 sec	66 sec	63 sec	56 sec
EASY FINANCE I (COMMODORE)	?	58 sec	13 sec	13 sec	11 sec

* = Will not fast load — defaulted back to regular load.
** = *Failed to load at all.*

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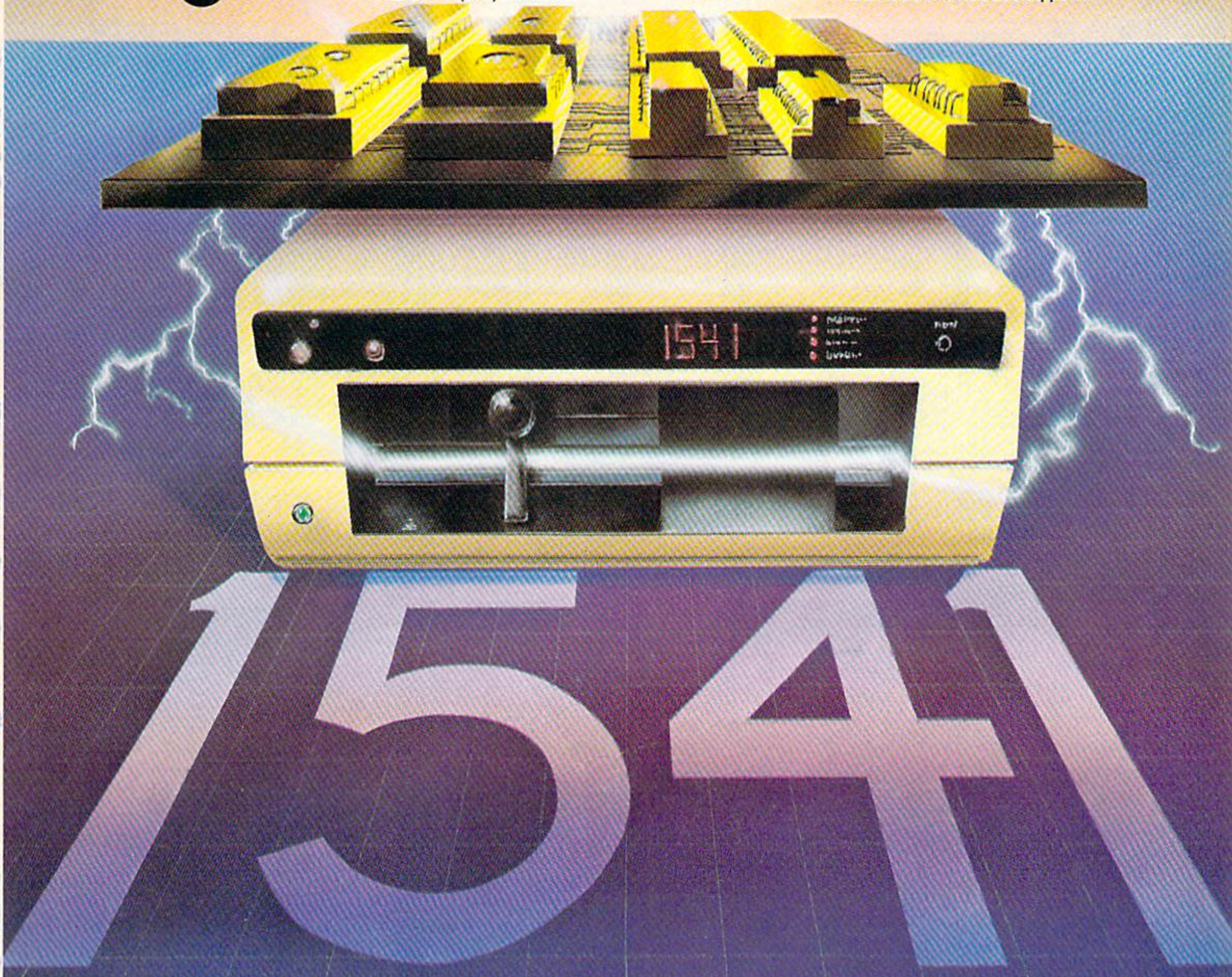
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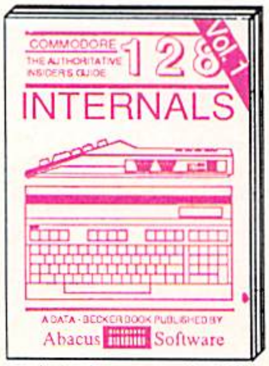
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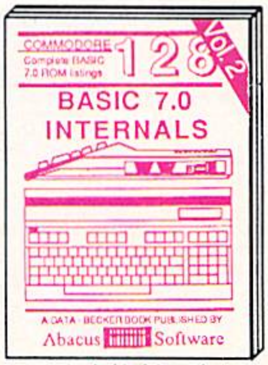
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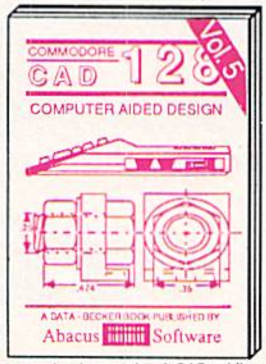
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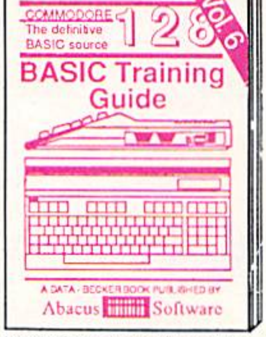
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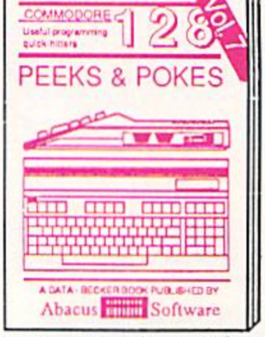
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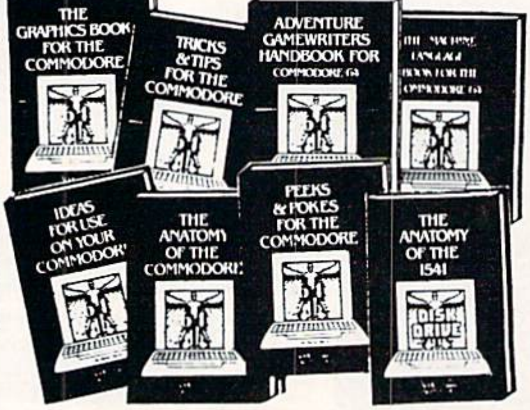
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Modes

A–Enable auto-insert mode
C–Disable auto-insert mode
O–Cancel quote and insert mode
X–Toggle between 40 and 80 column mode

Screen

L –Enable scroll
M–Disable scroll
F –Enable cursor flash
E –Disable cursor flash
T –Define top of window at cursor
B –Define bottom of window at cursor

(The next four are for 80 column mode only)

U–Create underline cursor
S –Create block (solid) cursor
R–Display screen in reverse video
N–Display normal screen image

Editing

J –Move to start of line
K –Move to end of line
P –Erase to start of line
Q –Erase to end of line
@–Erase to end of screen
D –Delete entire line
I –Insert blank line
V –Scroll screen up
W–Scroll screen down
Y –Set default tabs
Z –Clear tabs
G –Enable bell (Control-G)
H –Disable bell

dle of a program line? Without Escape codes, you must press the INST key the proper number of times to clear the space for the added characters. With ESC A, the computer enters an "auto insert" mode. Now as you type, the text to the right of the cursor is pushed ahead as the new characters are entered. You no longer have to count or guess the number of characters to be inserted.

There is one side effect to the auto-insert mode. Listings are displayed very slowly in that mode. If you type LIST and see your program printed almost character-by-character on the screen, chances are that the computer is in auto-insert mode. Use ESC C to disable auto-insert mode. You may now type over any characters on the line.

ESC O provides the ability to escape from the quote and insert modes. If you have just typed the first quotation mark or pressed the INST key, you are in the quote and insert modes. The cursor keys no longer move the cursor as before. In the insert mode, the DEL key no longer deletes the character to the left of the cursor. Instead these keystrokes appear as strange symbols. Pressing ESC O is handy for returning to normal editing mode without pressing RETURN and leaving the current line.

ESC X toggles the active screen from the 80-column monitor to the 40-column monitor. If the cursor is no longer visible on the screen, and your program is not running, perhaps it is blinking on the other display. Press the ESC key followed by the X key to see what the other screen looks like. If you are using the 1902 monitor, you must also press the 40/80 column switch on it.

On power up, or if you press the RUN-STOP and RESTORE keys together, the active screen is determined by the 40/80 DISPLAY key. ESC X allows you to use the other screen mode regardless of the 40/80 DISPLAY switch.

ESC M disables the normal scrolling of the screen. Usually when text is printed on the last line of the screen, the whole screen image scrolls upward, clearing the bottom line for more text to be printed. If scrolling is disabled, the cursor jumps to the top of the screen (or active window) after it prints the bottom line. Text on the screen is overwritten rather than moved out of the way. ESC L enables the normal scrolling mode.

Lines near the bottom of the screen do scroll off the screen even when scrolling is disabled if text is inserted into upper lines on the screen. For an unusual effect, press ESC A then ESC M and then list a program several times.

ESC E is just the thing if you find the blinking of the cursor to be annoying. The cursor may be harder to find,

Continued on page 95

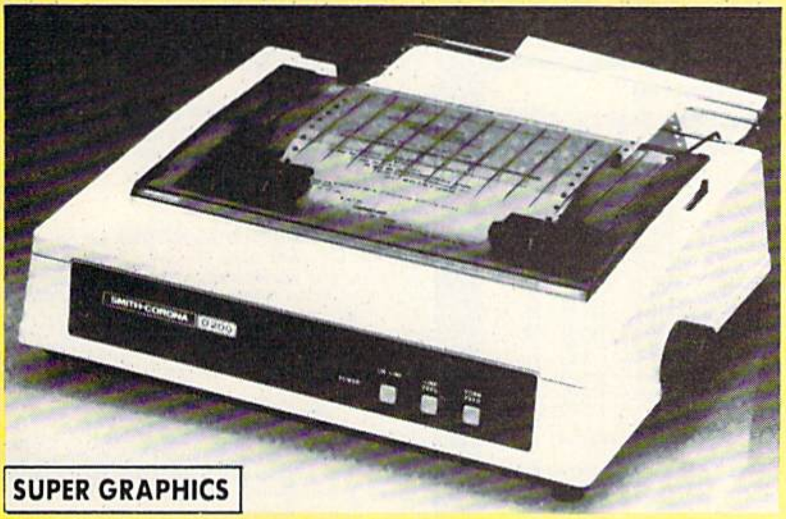
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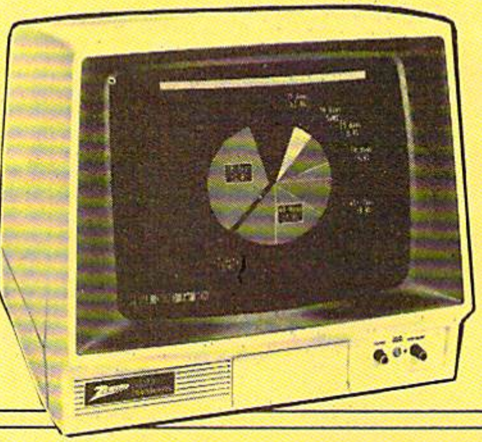
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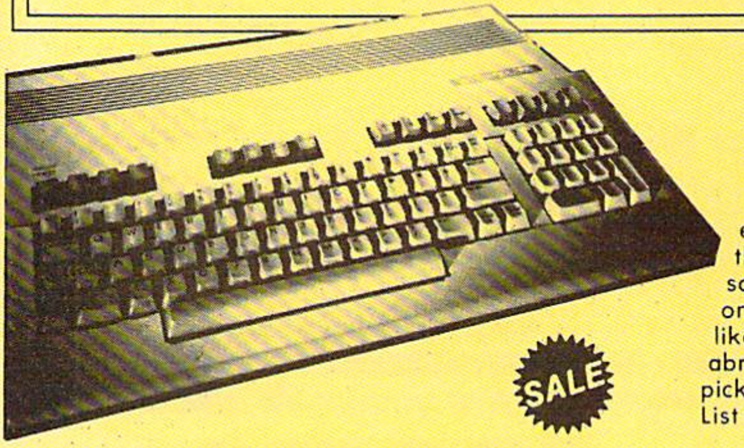
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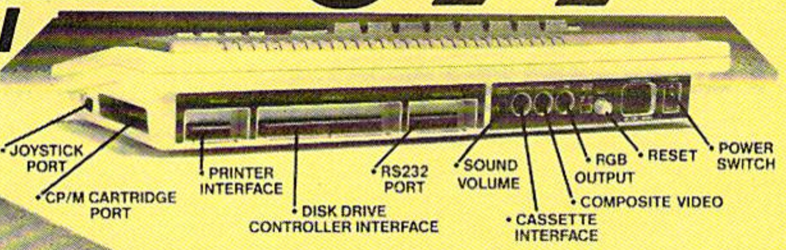
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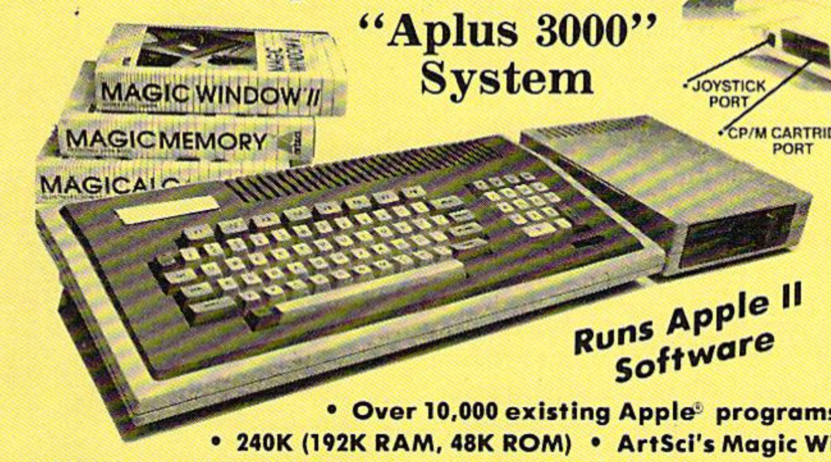
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A plus 3000 is a complete, self-contained computer based on the popular 6502A microprocessor and can tap into the tremendous software library of Apple II. Features include 192K Bytes RAM, 32KB Enhanced Microsoft BASIC, 80 column text, 560H X 192V color graphic display, 81 key sculptured keyboard and high efficiency switching power supply. Also included as standard are Centronics bus printer interface, Cassette interface, 4 channel sound generator, and 5¼" Apple Compatible Disk Drive.

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— Character set with normal, inverse and flashing capabilities.

• GRAPHICS

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— 280H X 192V 8 colors bit image — Black, White, Red, Green, Blue, Cyan, Magenta, Yellow.
— 560H X 192V 6 colors — Black, White, Violet, Green, Blue, Orange. (High resolution color monitor required)

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Features	Aplus 3000	Apple IIe	Commodore C-128
RAM	192K	64K	128K
Runs Apple II Software	Yes	Yes	No
Function Keys	24	None	16
4 Voice, 6 Octave Sound	Yes	No	Yes
Composite Video	Yes	Yes	Yes
Disk Drive	Included	Extra Cost	Extra Cost
Numeric Keypad	Included	Extra Cost	Included
Video Cable	Included	Extra Cost	Extra Cost
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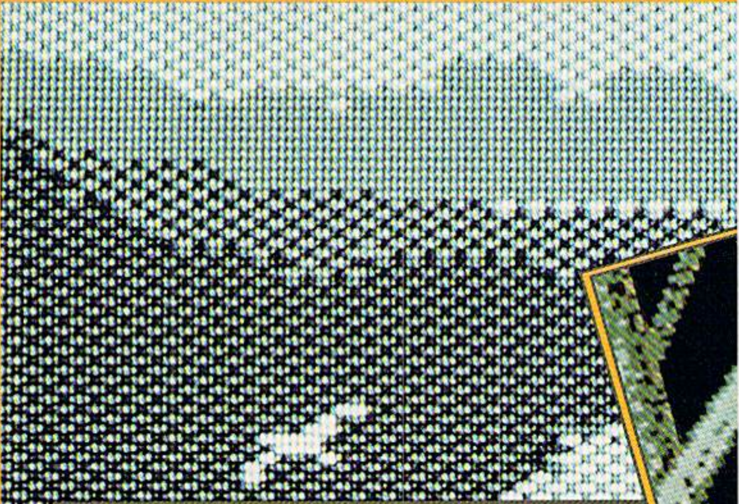
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ART GALLERY

Contributors to *Ahoy!'s Art Gallery* will receive royalties based on the sale of disks. Send your best work on disk, accompanied by a stamped and self-addressed mailer, to Morton Kevelson, P.O. Box 260, Homestead Station, Brooklyn, NY 11229. Indicate the drawing package that was used to create the image. If you employed a bit map of your own design, indicate the appropriate file parameters, i.e., hi-res or multicolor, location of bit map, screen or color data.

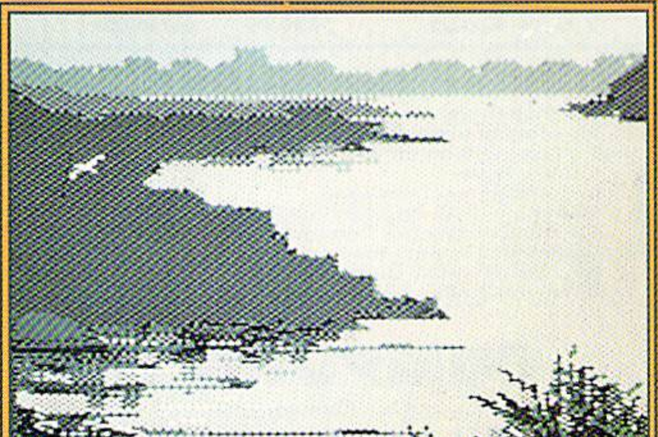
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Art Gallery images are available on disk. High resolution bit-mapped images are available in *DOODLE!* format. Multicolor bit-mapped images are available in *Koala* format. Each disk includes a slide show program for easy viewing. *DOODLE!* disks include a bit map screen dump utility for the 1525 or properly interfaced dot matrix printer. *Koala* disks include a set of custom routines for bidirectional conversion to other multicolor formats. The conversion routines were expressly developed for the *Art Gallery* by Michael Beutjer of K.T. Software, author of the *Koala Printer* program and *Quad Print* (June '85 *Ahoy!*). Formats presently supported are *Cadpic, Peripheral Vision, Paint Magic,* and *Flying Colors.* Disks are available for $15 from Morton Kevelson, P.O. Box 260, Homecrest Station, Brooklyn, NY 11229. Send a stamped and self-addressed envelope for a complete listing (or send $10 and receive a sample disk of DOODLE! and Koala images with slide shows).



It's not every month that we can find a theme running through the random collection of images Art Director JoAnn Case has chosen for the *Art Gallery* without straining our imagination and your gullibility to their limits. But this issue it's easy, as the computer artists in our reading audience take us on safari. Occupying center stage—who would argue with it?—is *Tiger* by Stephen L. Wise (Jeffersonville, IN), drawn with Koala. At lower right is *Cita* by Alberto Valsecchi (Milano, Italy), created with *Koala Painter* on the Koala Pad. To its left is *Bird* by Barri Olson (Madison, WI), also rendered with *Koala Painter* and the Koala Pad. The next piece to the left is *Seagull* by Robert M. Ellis (LaSalle, Quebec), generated with the Suncom Animation Station. Mr. Ellis is a longtime oil painter who based this and the 15 other samples he sent us—his first computer graphics efforts—on his memories of Pocologan, a small fishing village in New Brunswick. The entire menagerie is seen against a backdrop of Barri Olson's *Morning*, shown unobscured at lower left.

To answer the question posed in last month's *Art Gallery*—what did Dennis Lunde's four images have in common—if all four were the same size (which they were before we enlarged two of them to throw you off) and were laid top to bottom, they would form a continuous vertical mural.






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FREE RAM CHECK

For the C-64

By Buck Childress

I hope you used *Memory Check* (January '86 *Ahoy!*) to test your BASIC RAM, and that your good Ol' 64 checked out fine, like mine did. If so, I guess we'll have to stop blaming Old Reliable when our works of wonder launch themselves into oblivion. Or will we? The 64 has some areas of free RAM that BASIC doesn't use. Maybe we can blame one of them!

Free RAM Check will test the three remaining areas of 64 RAM. They are 679-767, 828-1023, and 49152-53247. These areas of free RAM are where many machine language programs and subroutines reside. In addition, locations 828-1019 make up the cassette buffer. This is where data is temporarily held when you use your datasette. If this area were on the blink, using a datasette could be difficult, if not impossible.

Free RAM Check works by attempting to store all values from 0 through 255 in each memory location. If successful, it moves to the next location. The RAM area currently being checked is displayed and, if all locations in that area check out fine, *Free RAM Check* will print "OK". Should a bad spot be encountered, "ERROR" will be printed. *Free RAM Check* then moves to the next area of free RAM. When all three areas have been checked, the test is over. The whole process only takes about 30 seconds.

While *Free RAM Check* is running, you'll see what appears to be a shimmering object. This is a video display of the values being stored in each memory location. It appears to be shimmering because of the great speed of machine language.

After you've entered and saved a copy of *Free RAM Check*, switch your computer off, then back on. This will clear the memory and reset everything to normal. (This is just in case you've been running any programs that alter memory pointers.) Now load *Free RAM Check* and run it. The loader will POKE the data into memory and check for errors. If one is found, the corresponding line number will be given. If all is well, type SYS 40000 and press RETURN. *Free RAM Check* will do its thing. If for some reason you want to stop *Free RAM Check* before it's completed the task, RUN STOP/RESTORE will bring it to a halt.

As with my BASIC RAM, all of my free RAM checked out fine. So, the next time one of my masterpieces takes a dive, I guess I'll have to admit it was me after all… well, maybe a power surge?! □

SEE PROGRAM LISTING ON PAGE 111

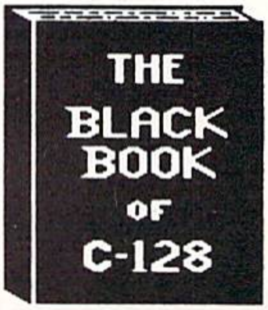


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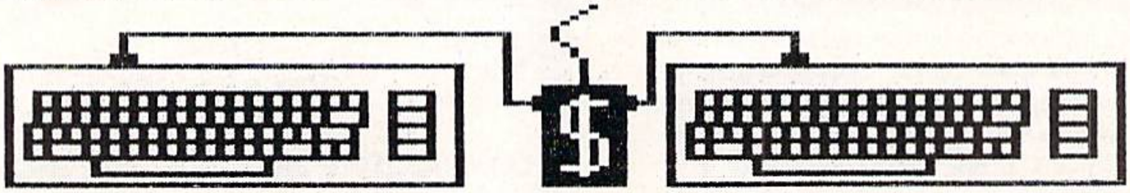
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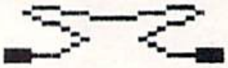
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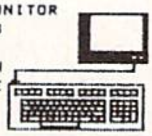


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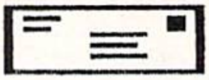
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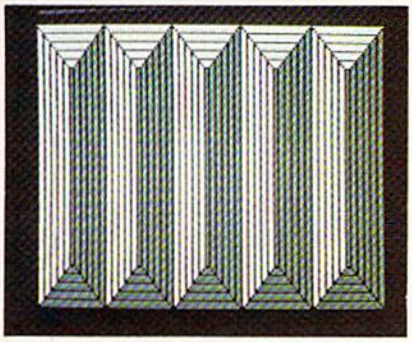
THE C-128 GRAPHIC BIT MAP

What Goes on Behind the Screens with BASIC 7.0's Graphic Commands

BY MORTON KEVELSON

Including BASIC 7.0 Graphics Drawing Programs by Doug Bannon and C-128 Bit Map Save and Load Routines by Morton Kevelson

The VIC chip's capabilities can be easily accessed on the C-128. Its built-in BASIC 7.0 comes with a rich set of graphic commands for manipulating the high resolution video display. As with the C-64, the C-128 has two bit-mapped modes–high resolution and multicolor. In fact, the hardware behind the C-128's 40-column display and the C-64's display is identical. We will shortly show how to import graphic images created with the C-64 into the C-128.



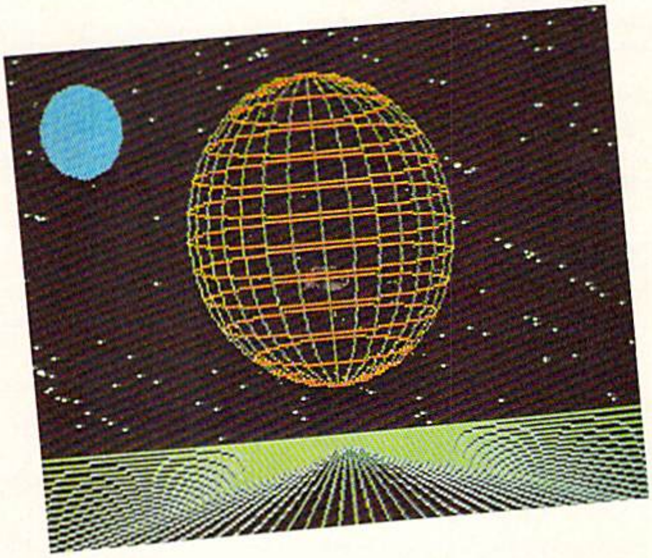
Pyrbar, *a product of the C-128's multicolor bit-mapped graphic mode.*

The BASIC 7.0 command for turning on the high resolution bit map display is

```
GRAPHIC 1,1
```

where the first 1 specifies the high resolution display mode and the second 1 clears the graphic screen. If you have just entered this command, your screen will have cleared and text entered from the keyboard will no longer appear on the screen. Don't panic! Just hit RUN STOP/RESTORE and you will be back to normal. Better yet, press function key 1, type a 0, and hit RETURN. The original text screen should reappear with all text intact. That is, if you had not previously redefined the contents of f1. You should also notice at this point that the text screen was updated, although it was not visible while the graphic screen was active.

Several things happen when the GRAPHIC command is executed. Nine kilobytes of RAM in bank 0 are immediately reserved for the bit map display. This reserved memory is located right at the start of BASIC's program space. Any programs already in this space are safely relocated right above the graphic RAM. Executing a FRE(0) command will show that program space has been reduced by the proper amount. This memory can be reclaimed for BASIC programs with the GRAPHIC CLR command.

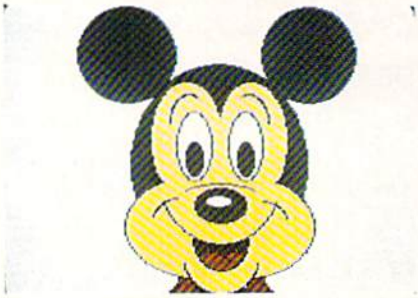


The high-resolution **Planets,** *like the other Commodore 128 graphics appearing on this and the following page, was rendered by Doug Bannon.*

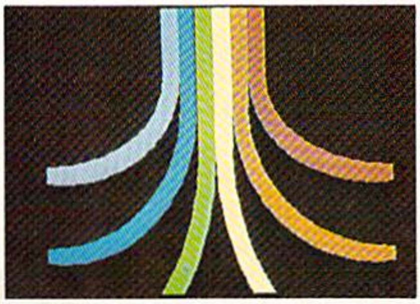
On page 40 is a map of the affected part of the C-128's RAM space. Note that this map only represents bank 0 RAM. The first kilobyte is used by the operating system and BASIC. The next 1024 bytes ($0400-$07FF) are the text display RAM. Note that this is the same area which is used for this purpose in the C-64. The next five kilobytes are reserved for BASIC and the operating system. Beyond that (starting at $1C00) is where BASIC 7.0 programs are normally stored. If a graphic mode is active, the start of BASIC is moved up nine kilobytes to $4000.

HI-RES GRAPHICS

The nine kilobyte graphic RAM is divided into two parts. The first 1,000 bytes, or video matrix, contains the high resolution color information. Each byte can store two colors. The lower nybble (first four bits) contains the background color. This corre-



The **Multicolor Bit Map** *programs on page 111 will generate Mickey.*



The multicolor **Colari** *resembles the logo of a Commodore arch-rival.*

sponds to COLOR 0 in GRAPHIC 1 mode. The upper nybble is the foreground color corresponding to COLOR 1. This 1,000 bytes, which we will refer to as video RAM, extends from 7168 to 8167. The remaining 24 bytes of this kilobyte are not used.

The actual bit map data is stored in the 8,000 bytes starting at 8192. The design of the video display chip makes it convenient to break up these 8,000 bytes into 1,000 eight byte blocks. Each group of eight consecutive bytes, or character cell, can display 64 individual dots or pixels. The display colors for each character cell are determined by the information stored in one byte of the video matrix. Bits which are set to zero, or off, display the background color. Bits set to one, or on, display the foreground color.

The arrangement of the 1,000 character cells follows that of the text screen. The result is a high resolution bit map display which is 320 pixels wide by 200 pixels high.

SAVING THE HI-RES DISPLAY

Whenever BASIC 7.0 draws a picture it is placed into this nine kilobyte block of RAM in bank 0. The BSAVE command makes it easy to SAVE this information to disk. SAVEd images can be redisplayed by turning on the appropriate graphic mode and BLOADing them into RAM. If you are using a 1571 disk drive the procedure may be quicker than redrawing the image.

At this point you may wish to set up an image for saving to disk. You can use one of your own graphics programs or the *Hi-Res Bit Map Draw & Save* program on page 110. Before saving the image you may want to make note of the border color. This is readily done by:

```
BANK 15:PEEK(DEC("D020") A
ND 15
BANK 0:POKE 8168,A
```

The bit map image may now be saved with

```
BSAVE "PLANETS.BMP",B0,P71
68 TO P16191
```

Restoration of the display is equally straightforward. First set the graphic mode:

```
GRAPHIC 1
```

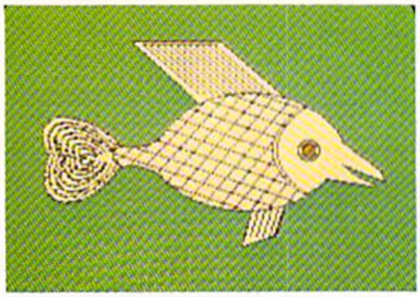
Then load in the bit map:

```
BLOAD "PLANETS.BMP",B0,P71
68
```

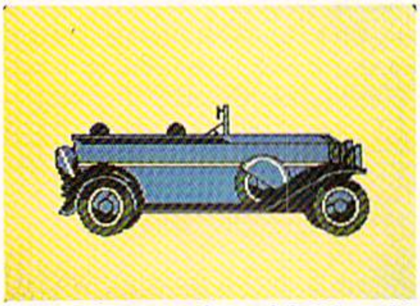
Finally restore the border color with

```
BANK0:A=(PEEK(8168))+1
COLOR 4,A
```

If you have some high resolution bit map images from the C-64, the same procedure can be used to display them, if they are in the proper format. In fact, images created by the *DOODLE!* drawing package from City Software are already in the proper format. The only thing not saved is the border color. Just load the *DOODLE!* image using its proper filename. Once an image is loaded into the C-128's graphic RAM it may be modified, or drawn upon, with any of BASIC 7.0's graphic commands (refer to the appropriate section of the *Commodore 128 Personal Computer System Guide*).



Scaled-down version of a multicolor **Fish**, *with twice the color of hi-res.*



Auto, *also a product of C-128 multicolor mode (160 horizontal pixels).*

MULTICOLOR GRAPHICS

The C-128 has a second bit map display mode. The multicolor bit mapped graphics mode can display up to twice as much color in a character cell as the high resolution mode. The tradeoff is a reduction in the horizontal resolution to 160 pixels. Note that the size of the image is still the same as each horizontal pixel is twice as wide. The basic screen arrangement is the same as before with each character cell composed of eight bytes. The difference is that it takes two bits to display a single pixel. Thus a character cell is four pixels wide and eight pixels high.

Two bits may represent four possible values: 00, 01, 10, and 11. As you might expect, these are pointers to the four possible display colors. The 00 value selects the screen background color found in the lower nybble of 53281 ($D021). This color is common to the entire display. A value of 01 takes its color value from the upper nybble of the corresponding byte in the video matrix. A pixel value of 10 looks at the lower nybble of the same byte. A value of 11 finds its color information in a second 1,000 nybble block which we will refer to as color memory. Thus we find that the multicolor mode character cell is

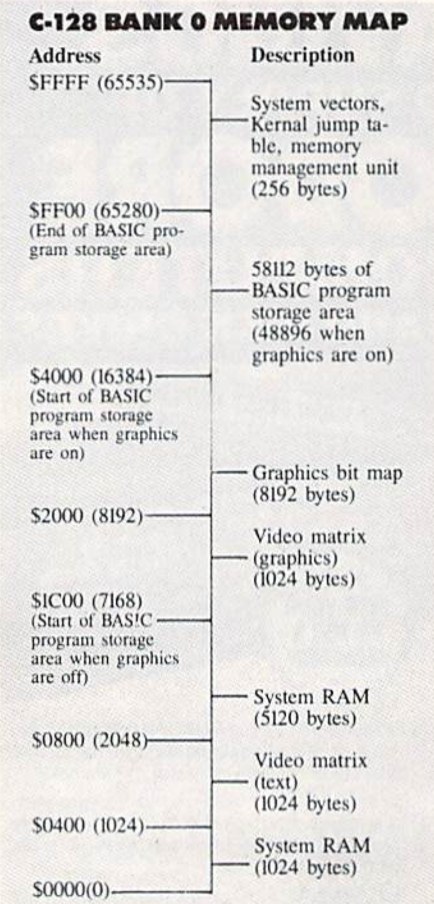
composed of 32 pixels displaying up to four colors at once. Three of these colors are independent of all the other character cells and one is a common background color for the entire screen.

Color memory is a separate block of 1,000 nybbles starting at $D800. Notice we said nybbles and not bytes. This section of RAM is only four bits wide. This RAM is not part of the C-128's BASIC RAM. It is found in the I/O block located in bank 15. Actually, there are two banks of color memory for a total of 2 kilonybbles. One of these banks is the color memory which is used for the text screen. The other is used for the bit map display. This allows the C-128 to maintain and update the text display while maintaining a separate multicolor graphic screen.

SAVING THE MULTICOLOR DISPLAY

At first glance, completing the multicolor image requires no more than saving the 1,000 nybbles of RAM starting at $D800 in bank 15. Unfortunately, things are not that simple. A BSAVE of this block would only preserve the color information for the current text screen, not the multicolor bit map screen. In fact, it is the cleverness of BASIC 7.0 which works against us. The constant maintenance of both the text and graphics screens is handled automatically, by BASIC, regardless which screen is currently displayed. In fact, the split screen mode displays parts of both screens at once. The microprocessor normally sees the color memory associated with the text screen except when a graphic update activity is taking place. The VIC chip will see either bank depending on what is currently displayed. In the split screen modes (GRAPHIC 2 or GRAPHIC 4) the VIC chip's attention is redirected from one screen to the other in mid-display.

The microprocessor's I/O port at address 1 controls which bank of color RAM is seen by each device. Bit 0 of this port controls the bank seen by the microprocessor. Bit 1 directs the attention of the VIC chip. We cannot simply POKE a value into this



register. BASIC 7.0 acts to frustrate us in this regard. The contents of this register are automatically updated 60 times per second. This update is triggered by the Raster Compare IRQ (Interrupt ReQuest) generated by the VIC chip itself. In order for our POKE to take effect we have to first turn off this interrupt. First we select the bank

```
BANK 15
```

Then we turn off bit 0 of 53266 ($D012):

```
POKE(DEC("D01A")),PEEK(DEC
("D01A")) AND 254
```

Next we turn off bit 0 of location 1, which directs the microprocessor to graphic color memory:

```
POKE 1,PEEK(1) AND 254
```

Now we can save it:

```
BSAVE"COLOR MEM",B15,P5529
6,P56395
```

Finally we carefully clean up with a pair of POKEs:

```
POKE 1,PEEK(1) OR 1
```

```
POKE(DEC("D01A")),PEEK(DEC
("D01A")) OR 1
```

Note the order of the last two POKEs. Reversing this sequence may mess up your graphics display.

Of course, the bit map and video matrix have to be saved as well. The procedure is similar to that used for saving the high resolution bit map. Before you save the bit map you should make note of the multicolor screen common background color. This can be easily done by

```
BANK 15:B=PEEK(DEC("D021")
) AND 15
BANK 0:POKE 8169,B
```

Loading and displaying the image is similar to displaying the high resolution screen. Just remember to restore the background color with

```
BANK 0:B=(PEEK(8169))+1
COLOR 0,B
```

Saving and restoring the border color is the same as for the high resolution screen.

See the sample programs on page 110-111 for a complete listing. The routines for creating sample images are by Doug Bannon; the save and load routines are by this writer.

KOALA AND THE C-128

We have shown how a C-64 *DOODLE!* image may be easily displayed on the C-128. Graphics created with the Koala software may also be displayed in a similar fashion, but it will take a little more work. The multicolor graphic mode Koala image file will have to be slightly rearranged. We will illustrate the technique using the C-128's built-in machine language monitor.

Enter the monitor by hitting function key f8 or entering MONITOR from the keyboard. LOAD the Koala image into bank 1 at $6000 with

```
L "?PIC A NAME*",8,16000
```

Note the use of the ? and the * wild card characters to avoid problems with the Koala image file names.

Move the video matrix to $5C00:

```
T 17F40 18327 15C00
```

Copy the background color:

```
T 18710 18710 15FEA
```

Save the video matrix and bit map:

```
S"PIC A BMP",8,15C00,17F40
```

Save color memory:

```
S"PIC A CMM",8,18328,18710
```

The resulting files can now be handled as described above. Just remember to pick your border color with a COLOR 4,X command. The *Koala to C-128 Converter* program on page 111 performs the same series of tasks using BASIC. ☐

SEE PROGRAM LISTINGS ON PAGE 110

FEATURED THIS MONTH:

GOING FOR THE GOLD!

A Strategy Guide to Epyx's Olympic Series

By Bill Kunkel

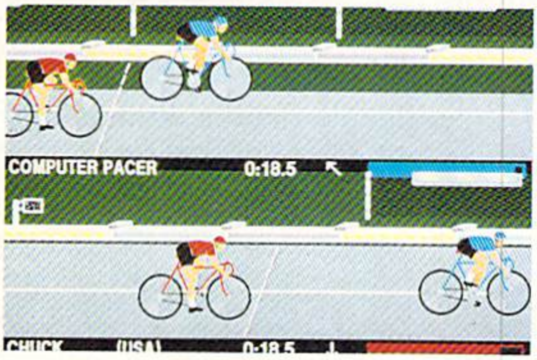


Before *Summer Games* (Epyx) came along, track and field simulations were remarkable mainly for the number of mutilated joysticks and strained arms they produced. Unlike previous titles, which required the gamer to jiggle the joystick to simulate running, *Summer Games* introduced much more elaborate control schemes which raised the strategy stakes. Even lightning reflexes won't automatically set records and win medals. That characteristic has made the trio of entertainment classics attain cult status among competition-minded computerists.

Summer Games and its sequels *Summer Games II* and *Winter Games* break down the movements of the onscreen athletes into a sequence of commands, which the computerist must execute with perfect timing. Expect to perform at the superstar level only after minute analysis and plenty of practice.

The good news is that there are some basic tactics and approaches which users have already proven effective. They won't turn you into an electronic Jesse Owens overnight, but they can improve the learning curve.

The Pole Vault, for instance, can be broken down into four separate movements/sequence commands. After running up to the crossbar, the onscreen athlete must plant his foot and rise off it with as much momentum as possible. Next, the pole must be driven downward just before reaching the disqualification line. The most crucial moment in the vault comes when the athlete kicks up and over the crossbar.



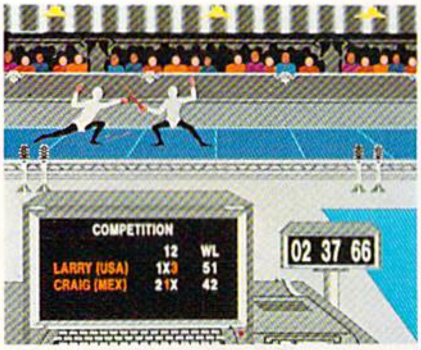


Winter Games *(top) features bobsledding, skiing, and skating competitions.*
READER SERVICE NO. 153

Summer Games II *(left) boasts graphics superior to its famed precursor's.*
READER SERVICE NO. 154

Summer Games *(bottom) introduced sophisticated control schemes.*
READER SERVICE NO. 155

The first thing to get down absolutely pat is timing the approach. Learn to drive the pole at the same point in the run every time. Use the vault's position relative to details in the background to make sure you always start from the same point. Begin the kick when the pole attains a 40-degree angle. Finally, release the pole when it points straight up to sail blissfully over the bar.

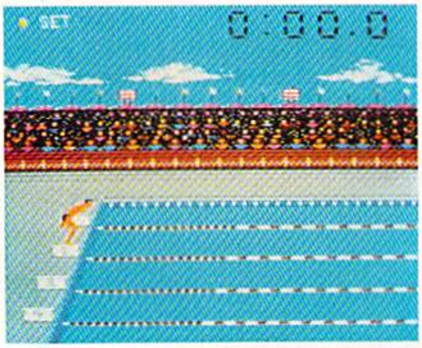


Parrying with a circular motion will aid the **Summer Games II** *fencer.*

Diving is a form-oriented event. No matter how many midair gyrations the onscreen competitor performs, the score will be low unless he cleaves the water in a vertical line. The acrobatics on the way down certainly add to the score, but you can always add flourishes after mastering the splashdown.

The key to good form is watching the diver's head and shoulders. Once he is 75% of the way down, wait for his head and shoulders to arrive perpendicular to the water and push the joystick forward.

The one straight-ahead joystick jiggler is the 100m Dash. The best hint: squeeze a rubber ball to develop hand strength and endurance.



Key to **Summer Games** *swimming is timing strokes for smooth rhythm.*

The 100m Relay, however, requires much more strategy. The key here is learning when to turn on the afterburners in order to reach the next relay-runner at top speed. Fortunately, the program itself provides an impossible-to-miss visual cue—the letters "U-S-A" appear in the stands. When this message is flashed, go for the gusto and don't stop until you've passed the baton. Note that the last runner actually has a bit more stamina than his fellows and can launch his finishing sprint a tad earlier.

The gymnastic competition is very challenging, so get off on the best possible foot. Attempt to hit the springboard at the far edge and perform a complete 180 degree body twist. When the gymnast is perpendicular to the horse, press the button for a strong pushoff. Once the athlete is in the air, moving the stick up or down controls the speed of the rotation.

The key is a quick and accurate analysis of the initial leap. This determines how many somersaults the video Olympian can safely perform. When the gymnast's feet are nearest to the mat, move the joystick down, then correct any imbalance in the dismount by steering the stick left or right. If the gymnast is veering to the left, move the stick to the right, and vice versa.

The three swimming events—freestyle, relay, and 100m race—boil down to timing the strokes to generate a smooth, continuous rhythm. Push the button as the arcing hand touches the surface and hold it down an instant longer as the hand pushes beneath the water. Then release the button and repeat the cycle.

Skeet shooting becomes a lot easier once the user memorizes the launch pattern of the targets, but beyond that, this event is a rigid test of hand-eye coordination. Remember to correct for the downward tug of gravity when sighting targets.

The events in *Summer Games II*, while more ambitious graphically, rely on many of the same strategic techniques. The most difficult, however, is clearly the triple jump.

Think of the onscreen performer in this event as a stone skipping over the surface of a lake and time the jumps in a smooth sequence. Only practice will enable users to avoid this event's greatest pitfall, the foul line.

The javelin toss is the first "throwing" contest in this Olympic series. Speed is secondary to timing and setting the correct angle to maximize the distance of the toss. With the javeliner moving to the line at a brisk, steady pace, point the joystick shaft to the desired trajectory and let it fly. Try to keep the angle close to 45 degrees. A shallower arc runs the risk of plowing up the field, while a cloud-kisser won't pick up good distance.

Some of the tactics mastered in *Summer Games* can be adapted to events in *Summer Games II*. The high jump is much like the pole vault, minus the pole, of course. Similarly, the rhythm-oriented strategy discussed for swimming works quite well on the rowing and cycling contests.

The equestrian event requires the user to learn some new command-sequences. As the horse approaches a jump, the player moves the stick to the right (the direction of all jumps), then quickly left, before returning to the canter and trot. Also, don't jump the horse too near the obstacle. Computerized steeds can be just as adamant in refusing a jump as real hay-burners.

Fencing requires a tremendous amount of practice, but there are a couple of moves which will win more than one match. Execute a parry with a circular motion, and only strike while moving forward.

The season is different in *Winter Games*, but the game is essentially the same. Once again, track and field experience applies directly to mastering the contests.

The Hot Dog is actually quite similar to diving. The athlete performs a series of stunts while falling downward, each inaugurated by a single joystick movement. And like diving, the difference between a good score and a bad one is learning when to cut the gyrations and prepare for landing.

In the ski jump, a good takeoff is largely a matter of proper timing. The user must hit the joystick button, instigating the jump, just before the tips of the skis touch the end of the run-

way. While in the air, push the skier far forward to make him as aerodynamic as possible and instantly correct any flaws in his form.

Remember, landing on your feet isn't enough. Failure to maintain form all the way down costs precious style points.

The other skiing event is the biathlon, certainly one of the most peculiar contests in the Olympics. The athlete must ski, cross-country style, over rugged terrain for great distances, pausing only to fire his rifle at the targets.

Movement on skis is similar to the swimming command-sequence in that consistent rhythm is all-important. When the skier slows down or comes to a steep incline, however, the user has no recourse but to flip the joystick shaft back and forth, left-to-right, as quickly as possible. To ski downhill, pull the joystick down when the skier's arms move out in front of his body.

During the shooting sequence, the targets rotate like slot machine wheels, a sure indication that a marksman requires timing as well as aim. Even when ejecting the spent shell after each shot, try to keep the sight level, so that it can swivel smoothly from target to target.

There are three types of skating: figure, freestyle, and speed. The figure and freestyle competitions use identical movements, all invoked with a series of single commands, but in the speed event, the user has more flexibility in move selection.

Never forget that it is impossible to land while skating forward. Always emerge from spins in good form or you'll spend a few penalty seconds sweeping the ice with your skater's posterior.

In freestyle, perform as many of the high-rated movements as possible three times each. No sense going overboard, since additional repetitions don't count. Blend them with the music. Certain moments suggest a camel spin while others seem to demand a forward triple. This event rewards the gamer's artistic sensibilities.

Speed skating, on the other hand, employs a command system similar to swimming and bicycling. The user gets into championship rhythm by moving the joystick shaft left and right in time to the skater's stride. Once the rhythm is established, slowly but surely increase the speed. If you blow the rhythm, start over slowly, and regain momentum a little at a time.

Finally, the bobsled event is perhaps the most thrilling and visually impressive contest on this program. Alas, it is also the most predictable. Since the course is always the same, and involves a limited number of turns, the course is fairly simple once the gamer memorizes the twisty route. So as not to reduce speed, don't bank the sled more than is necessary to hold it on the track.

These guidelines won't put you on the high-score board right away, but they are a good point of departure. With practice, you'll develop tricks like these which will work especially well for you. And then you can go for the bronze, silver, and gold.□

COMPUTER BOXING

Punch Programs Make Computerists into Lords of the Ring

By Arnie Katz



The best overall boxing simulation.
READER SERVICE NO. 156



Star Rank Boxing *pits you against 19 increasingly fearsome foes.*



Championship Boxing: *versatile.*
READER SERVICE NO. 157

The Kid looks bad, you think, as he staggers back to the corner. While the seconds perform their rituals and the cut man works his healing magic, you whisper, "You can take him, Kid," with a confidence you don't entirely feel. "Keep going for the body," you add as the bell rings.

Boxing scenes like this, with minor variations, have become familiar, even to those who don't follow the actual sport, through movies like the "Rocky" series, "Body and Soul," and "Raging Bull." The manly art of self-defense has persisted despite millenia of criticism from medicos and moralists. Even outright bans couldn't stamp out pugilism.

The elements which attract fans, like the interplay of strategy and the sharply drawn lines of confrontation between the two fighters, have made simulations of fisticuffs incredibly popular among home computerists. There are currently four major boxing games on the market for the Commodore 64/128, and even the worst of them is excellent.

Ringside Seat (Strategic Simulations), by Carl and Anthony Saricini, is a statistically based game which uses an action-strategy format to explore the tactics of boxing. The program comes with a roster of famous

fighters of the past and present, representing all weight classes from Bantam to Heavyweight.

Roster disks, initialized using a routine included on the *Ringside Seat* disk, can store collections of up to 75 names. The documentation provides a step-by-step system for producing simulacra of any real or fictional fighter who ever stepped through the ropes. Of course, the accuracy of the model depends on the computerist's skill at quantifying an individual's broad range of abilities. Homemade boxers may not have the fine accuracy of those created by the Saricinis, but small misjudgments won't ruin the fun.

The gamer's viewpoint is clearly that of the manager. Prior to the start of each round, the player types a number on the keyboard which corresponds to one of seven possible strategies: fight flat-footed, cover up, charge in, stick & move, stay away, go for the knockout, and protect cuts. The fighter will pursue this course of action relentlessly during the following stanza. The only possible deviation is that a manager can order his or her charge to cover up to avoid a K.O. while combat is underway.

To avoid a technical knockout, a manager must closely monitor the cut status. When a body part is printed in red on a white background, it means a cut is bleeding. If the background shifts to blue, the cut has worsened. Should between-rounds ministrations prove successful, the closed cut is printed in black. The same section of the display also keeps a running tally of how many times each man gets knocked down in the round and the fight as a whole.

The representations of the boxers are small and lack detail, but they are fairly well animated. The figures resemble those utilized in *Lode Runner* and *Choplifter!* more than those found in the three competing titles. It's sometimes hard to tell who is connecting as the wraithlike fighters dance around the ring, but this one- or two-player contest gets a good ranking overall.

Championship Boxing (Sierra) is the most versatile of the games. It gives a choice among autoplay simulation, strategy, and arcade modes. The disk includes a selection of 57 prerated heavyweights, and a boxer generation setup that takes less than five minutes to complete.

The Murry Brothers previously authored editions for the Macintosh and IBM PC. It would be unrealistic to expect the graphics on the C-64 to equal those of the Macintosh version, but the art here is poor by C-64 standards. The fighters are large, but they are not gracefully drawn or well-animated.

In the action version, one or two players hit appropriate keys to make the boxer throw four different types of punches, cover up the head or body for defense, and move left or right. This play-mechanic causes crowding at the keyboard in head-to-head contests between human opponents, but works well solitaire.

The simulation is more a demonstration than a true game. The user selects any two fighters, and the program guides both men through the bout. It's fun to see great "what if?" combinations like Rocky Marciano and Muhammed Ali, but it is an essentially non-interactive entertainment.

The strategy mode again casts the computerist as a manager. Prior to the start of each round, the players pick a tactic from an onscreen menu. The choice of selection varies according to the round and the course of the bout to that point. The gamer can "shout" to his or her fighter during the round by tapping either of two keys. One causes the pugilist to cover up, while the other exhorts him to go for the knockout.

Fight Night (Accolade) is a joystick-actuated game which refuses to take boxing too seriously. A simple command control system lets the player fake or throw two types of

BOXING GAMES AT A GLANCE

(Programs are rated from 1(poor) to 5(outstanding))

	Ringside Seat	Championship Boxing	Fight Night	Star Rank Boxing
Graphics	2	2	5	4
Animation	3	3	5	4
Realism	4	4	3	5
Mental Challenge	4	4	3	5
Physical Challenge	1	5	3	4
Excitement	3	3	4	4
Documentation	4	5	5	5
Replayability	4	4	4	4
Overall Rating	3	3	3	4





Fight Night *lets the player build his boxers one body part at a time.*
READER SERVICE NO. 158

punches, block head or body shots, and move around the squared circle.

The program has five modules: "Boxing," "Construction," "Train," "Spar," and "Tournament." The first matches a constructed boxer against five successfully tougher foes. "Construction" offers a system for designing a boxer, including the details of his physical appearance. "Train" gives a chance to develop mastery over the control system. "Spar" allows two constructed boxers to fight. "Tournament" allows two managers to turn promoter and formulate a whole series of bouts.

Learning to precisely control a fighter takes training in the gym and a few practice bouts, but the system is really quite simple. In fact, the lack of complication is probably this program's most significant drawback. With only two punches, jab and body blow, ring movement becomes overly important. Too often, the victory in the game's three-round bouts goes to the fighter who does the best job of shoving his opponent into the ropes.

Calling the graphics "charming" would be an understatement. The comically drawn contenders in the "Boxing" module breathe life into the design. Dip Stick, also known as "old banjo eyes," is especially well-rendered. He looks like the proverbial 97-lb. weakling, but watch out for his below-the-belt sucker punch!

Since boxers are constructed one body part at a time, there can be considerable variation in the way they look in the ring. Attaching spindly legs and a bearded face to a powerhouse torso creates a very different look than if you blend a cigar-chomping head, pipestem arms, and tree-trunk legs into the same figure.

If watching Burgess Meredith guide Sylvester Stallone to the title in "Rocky" sets your pulse racing, *Star Rank Boxing* (Gamestar) is a "must have" disk. It simulates the totality of boxing better than any other home computer product, yet it is also exciting and highly playable.

The computerist first constructs a boxer and then matches him against a field of 19 increasingly fearsome antagonists. A new boxer starts at the bottom of the ladder and must score a victory in an 8-, 10-, or 12-round bout to usurp the foe's ranking.

A training period precedes each bout. The manager apportions the remaining time until the actual fight among five activities, each of which boosts one or more of the fighter's ratings. The light bag, for example, is the best way to build up punching speed.

The joystick controls the boxer during a bout. Holding the action button down produces a choice of several "inside" blows, while moving the stick without pressing the button produces longer-range punches.

The most unusual aspect of the control system is that the program controls the boxers' ring movement. The type of footwork each pugilist employs depends, in a general way, on what ring style the computerist chose for him during the boxer generation phase. This arrangement allows the manager to concentrate on punch selection, though watching your man slug toe-to-toe when you'd like him to retreat can be heartbreaking.

The disk has space to save a roster of boxers. This allows more than one person to have a continuing character or for a solitaire player to assemble a stable of contenders.

Star Rank Boxing, like most Gamestar titles, cannot be mastered in a day or even a week. This keeps it fresh long after games which provide quick success have grown stale.

Most boxing connoisseurs believe that the sport's "Golden Age" ended more than 30 years ago. Perhaps so. But the "Golden Age" of computer boxing is here today. □

HEART OF AFRICA

Electronic Arts
Commodore 64/128
Disk; $32.95

Today brave men and women tease death by vaulting into the heavens in primitive spacecraft. During the last half of the 19th century, those who wanted to court death frequently did so by venturing into the interior of the Dark Continent.

Although the continent's coastal regions were thoroughly colonized and explored much earlier, the jungles, climatic extremes, and often-hostile natives kept most Europeans from penetrating the mysteries of this mammoth land mass.

Heart of Africa, Ozark Softscape's sequel to the classic *Seven Cities of Gold*, presents the computerist with the opportunity to experience the danger and excitement of the unknown as an intrepid African explorer. As the game-scenario begins, a law firm has contacted the player and revealed that he is the heir apparent to the fabulous fortune of globetrotter Hiram Perkins Primm. No one has seen the enigmatic Mr. Primm since his last expedition set out two years earlier.

Before you can inherit the fortune Primm amassed in the casket business, you must prove to the executors of the will that you are committed to carrying on his life's work, "shedding light upon the dark continent." In practical terms, this means you must lead an expedition into the heart of Africa and locate the rumored Lost Tomb of Pharaoh Ahnk Ahnk.

The play-mechanic of this action-strategy game closely resembles the one employed in *Seven Cities of Gold*. The player moves the expedition around the strategic map with the joystick. When the explorers encounter a native village, a more detailed view replaces the topographical view. The player can then determine the party's behavior toward the Africans by selecting one of the options from the onscreen menu.

While the expedition has considerable latitude in dealing with the villagers, including the possibility of armed combat, it's often better to make friends with the inhabitants by trading with them. Villagers know where the valuables are located, and they provide clues to visitors.

As with any Ozark Softscape creation, *Heart of Africa* benefits from meticulous attention to detail. Your character can even become delirious and wander uncontrollably through the dangerous countryside. And fail-

ure to act in a civilized manner carries a significant penalty, just as similar heavy-handedness does in *Seven Cities of Gold.*

The program's glaring flaw is that bludgeoning works as well as subtle detective work. An expedition can stomp back and forth across Africa and find the Lost Tomb by sheer luck.

A harder-to-define problem is that *Heart of Africa* comes across as flat and not very exciting. It's a well-designed game, and the documentation tries hard to set the proper mood, but it never quite comes alive. Perhaps computerists who already have a strong interest in this period of history will find it compelling and enchanting, but this title does not have overpowering appeal to the typical gamer. It's a good try, but not a rousing success.

Electronic Arts, 2755 Campus Drive, San Mateo, CA 94403 (phone: 415-571-7171). *–Arnie Katz*

FIGHTER COMMAND

Strategic Simulations
Commodore 64/128
Disk; $59.95

Air cadets often get cocky after they earn their wings, so just because you graduate with flying colors from programs like *Flight Simulator II, Skyfox,* or *F-15 Strike Eagle,* don't think that this program will be a piece of cake.

Fighter Command shows that there's a lot more to military flying than hopping into a plane and finding someone who wants to dogfight. It is a thorough simulation of the "Big Picture." This program casts the computerist as what a true aviator would call a pencil pusher, the guy who allocates forces for various types of air missions. All that rides on these decisions is the fate of your country and the course of history.

SSI's own rating system judges *Fighter Command* "intermediate" in difficulty, and that might be a little low on the scale. This is certainly no computer wargame for a beginner. Charles Merrow and Jack Avery's most recent SSI title, *Wings of War,* is indicative of this title's overall complexity.

While *Wings of War* could recreate almost any individual air battle between World War II planes, *Fighter Command* focuses on the Battle of Britain. The solitaire competitor takes command of the beleaguered British forces as they try to repel the bombing raids of the Luftwaffe.

Keeping your forces ready is vital, but the defender must also anticipate where and when the Germans plan to strike next. And once the raids begin, Fighter Commanders must react with the forces in the air of ready to fly on the ground.

A series of menu-based commands makes it fairly simple to implement a wide range of strategies. To help the player monitor the location and status of the multitude of squadrons, SSI has provided a game board to give an overview.

This should tug at the heart strings of any wargamer who cut his teeth on board games. Each squadron has a marker to indicate where it's located, and whether it's on patrol, refueling, or merely in a state of readiness.

The five states of readiness are runaway alert, cockpit alert, hut alert, 30-minute alert, and two-hour call. The readiness ranking tells how long it will take a certain squadron to react to your call. Too much readiness for too long a period adversely affects the morale and performance of that squadron.

There are five possible scenarios, three of which cover specific time periods of the 34-day battle. The campaign game encompasses the entire tussle for air supremacy. Eagle Day is the introductory-level choice and covers only the first day of fighting.

The Germans have six different types of planes in the arsenal and the British possess five. Each is rated with historical accuracy as to speed, climb rate, ceiling, endurance, and bomb load.

The documentation is well-written, although somewhat sloppily arranged. It is a good idea to read the directions thoroughly before even booting the game for the first time. Even those who ordinarily take a seat-of-the-pants approach should expect to put in some study time. Some of the information you need early in the game isn't revealed until the final pages of the manual. The explanations are detailed and complete and the playing aids are far more than window dressing. It is virtually impossible to avoid a decisive German victory game after game against the computer without understanding the rules thoroughly.

The computer-directed Germans can play at several different skill settings. The game gets tougher as the human commander grows more capable. This keeps the program fresh even for those who primarily play solo.

Many games have treated the Battle of Britian, but *Fighter Command* deserves its place on the shelf with the best of them. So after you've enjoyed your Snoopy versus the Red Baron fantasy, find out what it's like to be the brains behind the brave in *Fighter Command.*

Strategic Simulations Inc., 883 Stierlin Road, Building A-200, Mountain View, CA 94043 (phone: 415-964-1353). *–Rick Teverbaugh*

SILENT SERVICE

MicroProse Simulation Software
Commodore 64
Disk; $39.95

During the frightening days after Japan attacked Pearl Harbor, repeated hammer blows sent the Allies running for cover and conjured lurid images of imminent attacks on Los Angeles and San Francisco.

The invasion of the West Coast never took place, of course. One reason was the work of the American submarine corps. The so-called silent service relentlessly harried the Japanese navy in its home waters and wreaked havoc upon the enemy's merchant marine fleet.

Sid Meier, justly famous for his outstanding air simulations, exchanges wings for a periscope to produce this solitaire recreation of undersea action. The same surehanded design sense which makes *F-15 Strike Eagle* both authentic and a positive pleasure to play are much in evidence in *Silent Service.* Although there's a lot happening, and five complete battle stations to oversee, the play-mechanic is so user-friendly that most armchair admirals will be ter-

rorizing the shipping lanes like veteran submariners within a couple of gaming sessions.

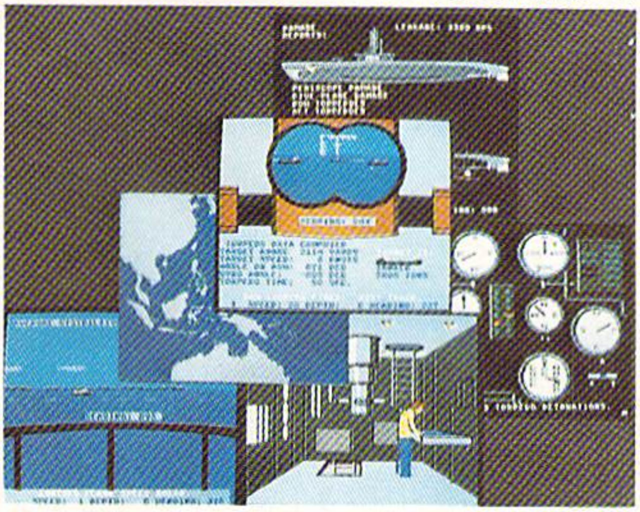
A joystick-actuated menu screen allows the user to customize the program to a considerable degree. There are four basic skill levels, and a menu of "reality factors" which further adjust the difficulty. A flick of the stick can introduce visibility limitations, allow the target ships to make evasive course corrections, or saddle the sub with the handicap of occasional dud torpedoes. The impact of these factors on the overall difficulty of the game is summarized at the bottom of the screen, which prevents the unwary from loading the game with difficulty-boosting extra elements.

Three types of scenarios are offered. Gunnery practice allows the novice to learn to control the ship and its weaponry, and Convoy scenarios are historically accurate recreations of actual World War II submarine engagements. Finally, the Patrol minigames dispatch your sub pack on a two-month mission to seek and destroy the adversary's shipping and naval vessels.

The conning tower, a beautiful full-screen drawing, is the submarine captain's primary station. The gamer moves the captain to the other battle stations with the joystick and hits the action button to switch screens. These other screens include the periscope, instruments and gauges, maps and charts, damage control, and the bridge. The player switches among these locations, using the joystick and keyboard commands to steer the sub, make it dive and surface, monitor combat damage, and aim and fire the torpedoes.

The target ships aren't minutely detailed, but players should have no trouble telling one type of ship from another. In fact, the Patrol scenarios require the gamer to pass a silhouette identification test before turning them loose in the Pacific. After all, we wouldn't want our submarines sending American craft to the bottom!

Don't mistake this for a boot-and-blast epic. Meier includes quick-start rules, but *Silent Service* is truly at its exciting best when the computerist understands the full depth of the simulation.

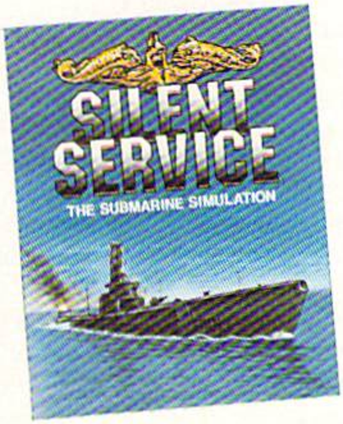


Silent Service ***offers a choice of gunnery, convoy, and patrol scenarios. From the conning tower you move the captain to other screens including instruments and gauges, periscope, and the bridge.***

On the other hand, this is not just for double-domed heavy thinkers. *Silent Service* is surprisingly simple to learn and play, thanks to excellent documentation and a logical rules structure.

Like Meier's *F-15 Strike Eagle, Silent Service* packs broad appeal for home computergamers while it challenges the wits of even master strategists. Score another direct hit for MicroProse!

MicroProse, 120 Lakefront Drive, Hunt Valley, MD 21030 (phone: 301-667-1151). *—Arnie Katz*



Fight the Jap in his home waters.
READER SERVICE NO. 159

ULTIMA IV
Origin Software
Commodore 64
Disk; $59.95

Trust Lord British, the eccentric but brilliant designer, to provide a new dimension in fantasy games, just when some prematurely called the *genre* old hat. The goal here is nothing less than complete self-perfection on a personal level.

The opening sequence resembles an illustrated adventure, with large pictures and a small text bar along the bottom. The main difference: you can't actually do anything besides press "Return" until the program deposits you at the door of a gypsy fortune teller, where the game really starts.

The woman deals eight cards, two at a time, and poses questions to the player with each new pair. Each question has two possible "right" answers. For example, she might ask a player whether he or she would be honest in a given situation. The answers directly influence the gamer's starting point and type of character (fighter, wizard, bard, etc.).

As in previous *Ultimas,* players give orders with single keystrokes. A menu-driven system would be an improvement.

The player starts alone, but can build up a party by inviting people in towns to join. The ideal group has eight characters, each a different class.

Talking and listening to everyone in town is the key to success. Each townsperson can hold a complete conversation. If a character hasn't asked your hero a question, you haven't heard everything that person has to say!

Ultima IV has a series of mini-quests which blend to form a larger whole. Eight large towns contain information leading to Runes and mantras, which are necessary to enter the shrines dedicated to various virtues,

including compassion, valor, humility, and sacrifice. Make sure you pay more than lip service to the virtues, though, because the program punishes "sinners" by making them work even harder to achieve goals. For example, snubbing too many beggars results in the player having to give even more gold just to "break even."

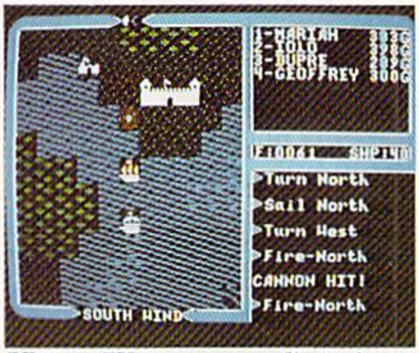
The proper Rune is needed to enter each shrine. Once inside, the player picks a virtue on which to meditate. The program actually forces you to stare at the screen for a few seconds each cycle, then asks for the mantra. Type in the correct word and you might be rewarded with a valuable insight—or even with partial avatarhood, meaning that you've attained perfection in that virtue.

The graphics, animation, and sound are all markedly improved over those in *Ultima III*. This is most obvious in the dungeons, where players can see fountains, chests, and, most important, monsters far down hallways. Entering a room often yields a bird's-eye view of the area, including treasures, monsters, traps, and secret doors. There are even a few tricks dropped in for good measure, like bridges that disappear unless the hero occupies the right spot, or secret passages that only open when someone picks up a particular chest.

Only Avatars—perfect people—can enter the Abyss, a danger-filled island where the Codex (the final goal) is rumored to lie. A few extra items are required to pass safely through the Abyss.

Magic is more complicated in *Ultima IV* than in past titles. Players can't just cast a spell, but must first assemble and mix the proper reagents, such as sulphurous ash, black pearl, and the exotic mandrake root.

Ultima IV is the most complicated *Ultima* yet, a must-have for those who want a true challenge. If you've never played through an *Ultima* scenario before, though, this is not a recommended starting point. Work up through the ranks from *Ultima II* and *Ultima III* first, since they're both easier to learn. But if you're already an Ultimaniac, dig out your notebook, settle into your most comfortable chair, and get ready for the ultimate *Ultima*.



Ultima IV: *most complicated yet.*
READER SERVICE NO. 160

Origin Systems, 340 Harvey Rd., Manchester, NY 03103 (phone: 603-644-3360). *—Tracie Foreman Hines*

ZORRO
Datasoft
Commodore 64
Disk; $29.95

Look out Sergeant Garcia and all the other oppressors of old California, the masked avenger with the lightning sword is coming! The latest entry in Datasoft's excellent series of action strategy contests, which already includes *Bruce Lee, Conan,* and *The Goonies,* casts the user as the foppish Don Diego de la Vega, better known as Zorro.

As the curtain rises in the game, "The Fox" watches helplessly as one of Sgt. Garcia's flunkies carries off his lady love to a drawbridge-fortified castle several playscreens to the right. To rescue her, Zorro must duel, climb, and explore a wide variety of playfields above and below ground level. There are vines and trees to climb, chandeliers on which to swing, and bumbling soldiers on whom the masked title character can carve his signature "Z."

There are also keys and other such objects, some possessing magical properties, which the gamer uses to solve puzzles and gain access to fortified areas. It is, in fact, these adventure game trappings that make this game so much fun.

Each screen presents several challenges, some of which are real headbusters. There are levers and counterbalances, trampolines and trapdoors, and, of course, plenty of dueling opponents to keep things moving. Although none of the bumbling sword-swingers chasing Zorro is fit to cross blades with the master, they can divert you from accomplishing more important business.

The graphics are good enough to satisfy most gamers, but there is no question that they are not up to previous entries in this series. Compare the underground screens, for example, with the beautifully elaborate tableaus from *Bruce Lee.* It's hard not to be at least a little dissatisfied with the current offerings.

There are some very nice visual touches, however. Zorro himself seems to be walking on tiptoes, but his movement is otherwise well-articulated. The soldiers look great, and after they've been vanquished by the masked man's rapier, they disappear —leaving only a ragged "Z" where they once stood!

The only other complaint lies with the meager documentation. Such a complex design requires more than two and a half pages of loading instructions and joystick commands. The few hints which the folder provides are helpful, but little is done to explain *Zorro's* many play nuances.

Zorro is nonetheless a tremendously enjoyable play-experience. The gamer quickly develops a real sense of being an adventurer, of scrambling over hacienda rooftops and swinging from flagpoles. The dueling sequences are great stuff, and the plethora of gamescreens will keep computerists coming back session after session.

Software Creations, 19808 Nordhoff Place, Chatsworth, CA 91311 (phone: 818-886-5922). *—Bill Kunkel*


Zorro: *some headbusting challenges.*
READER SERVICE NO. 161

BIG PRINT

Enlarged Characters for the C-64

By Paul Montognese

Bigprint is a machine language subroutine that prints characters in an enlarged mode four times the normal character size. Each enlarged character occupies 4 screen positions across and 4 down, a total of 16 bytes.

Bigprint is is invoked by way of a SYS call like the following:

```
SYS ml,S,V,H,B,E
```

The first parameter, ml, is the entry point of *Bigprint*: 49152.

S is the string of characters to be printed. It can be a literal value like "ABC", a variable like A$, or any other string expression that is normally acceptable to BASIC.

V is the vertical line number on which printing is to start and can range from 0 to 21. H is the horizontal start position with valid range of 0 to 36. Any BASIC numeric expression is allowed for specifying the horizontal and vertical starting positions. Further, either or both start positions may be specified using an asterisk, in which case the current cursor position is used to determine the vertical starting position, the horizontal starting position, or both.

B stands for blanks and specifies the number of spaces that will appear between enlarged characters. Values of 0 to 32 are allowed.

E stands for escape character and gives you the capability to specify some optional special effects. Escape can be specified as a string value or a numeric value. In either case you are indicating a single byte ASC character value that will be used to determine the escape code. More on this later.

SPECIAL SYNTAX PROVISIONS

Any of the numeric parameters may be omitted by simply keying the delimiting comma, in which case the value will default to zero. You can cause any remaining parameters to default to zero by simply terminating the statement. By way of illustration, each of the examples below will cause the word "HELLO" to appear in large characters starting in line 10, print position zero.

```
SYS ml,"HELLO",10,,0,0
SYS ml,"HELLO",10,0
SYS ml,"HELLO",10
```

A semicolon is used in place of SYS ml as a means of invoking *Bigprint* multiple times in succession without having to return to BASIC. The two examples below will print "HELLO" and "THERE" starting respectively on lines 6 and 11.

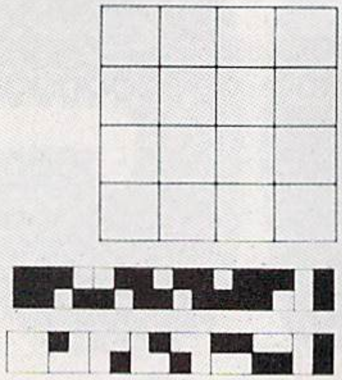
```
SYS ml,"HELLO",6,10:SYS ml,"THERE",11,10
SYS ml,"HELLO",6,10;"THERE",11,10
```

Both achieve the same net result, but the second method is faster.

FIGURE 1: ILLUSTRATION OF OVERLAY MODE

One enlarged character—each grid square is one byte.

Each grid square is formed by one of 16 block characters.



COLORS AND CHARACTER SETS

The large characters will initially be printed in the cursor color from location 646 ($286). You can change this by simply embedding color control characters in the string to be printed, the same as with a BASIC PRINT statement.

The same goes for the character images, upper case/gaphics, or upper and lower case. The large character images will be formed from the character set operative at the time of the SYS call. This can be changed by embedding the character set controls in the string, also in the same manner as you would with the BASIC PRINT statement.

Once changed in this manner, the color and/or character set specified will be in effect until changed to some other value. This holds true for the duration of one *Bigprint* call. Each new invocation, including the multiple invocations by the way of the semicolon, causes the values to be reset to the active cursor color and character set in use.

OTHER PRINT CONTROL CHARACTERS

The large characters will initially be printed in standard mode. To print them in reverse image simply include CTRL/RVS ON in the string at the point you want to start printing in reverse image and change back to standard image with CTRL/RVS OFF.

The four cursor controls (UP-DOWN-LEFT-RIGHT) are also recognized in much the same manner as BASIC PRINT. Simply include them in the string to be printed and they will cause their specified actions to occur.

Note that all of these manipulation controls are used on a strictly local basis by *Bigprint* for its purposes only. Upon return to your BASIC program, the current cursor position, color, and reverse on/off status are the same as they were before the call to *Bigprint*.

SPECIAL EFFECTS

A number of character manipulations are possible for use in achieving special effects. The last parameter of the SYS call is the escape character and works much like quote mode does when you're editing BASIC lines. When the escape character is encountered in the string to be printed, certain characters will be used to activate and deactivate special effect. Every other escape character encountered will turn off this capability, just as every other quote character turns off quote mode.

The escape character that you select in a given call to *Bigprint* is thus used exclusively to toggle control mode on and off and cannot itself be printed.

If control mode is active, an upper case U causes characters to be printed upside down while a lower case u reverts back to the normal rightside up mode.

An upper case "I" activates inversion while a lower case "i" turns off inversion. Inversion gives the effect of flipping a character image over from left to right. The left arrow character printed with inversion active will result in an arrow that points right.

An upper case L causes subsequent characters to be printed rotated to the left. An upper case R activates rotate right.

CONTROL CODE SUMMARY

The tables below are for quick reference purposes and list all the control codes that are processed by *Bigprint*.

Control Codes Always Recognized

Reverse On (18)	Sets Reverse Mode On
Reverse Off (146)	Sets Reverse Mode Off
Lower Case (14)	Upper/Lower Case Characters
Upper Case (142)	Upper/Graphics Characters
Cursor Up (145)	Up One Vertical Line
Cursor Down (17)	Down One Vertical Line
Cursor Left (157)	Back One Position
Cursor Right (29)	Forward One Position
Color Controls	Changes Character Color

Controls Recognized Only In Control Mode

Capital A (193)	The two color codes that follow will be used for every other large character
Capital U (213)	Upside Down Mode On
Lower Case u (85)	Upside Down Mode Off
Capital I (201)	Inversion Mode On
Lower Case i (73)	Inversion Mode Off
Capital L (204)	Rotate Left On
Capital R (210)	Rotate Right On
Capital O (207)	Overlay Mode On
Lower Case o (79)	Overlay Mode Off
Capital C (195)	Clears special effects and resets to print characters rightside up with no overlay—also terminates escape mode

Upper case O and lower case o activate and deactivate overlay mode. Normally the 16 individual characters comprising one enlarged character are simply placed on the screen. Overlay causes a special set of logic to be employed before each individual character is placed in screen memory.

To understand overlay mode you must first understand that each large character is formed by a 4 x 4 matrix of individual characters, 16 all together. In turn, each of the 16 individual characters is divided into a 2 x 2 grid, giving us a total of 4 blocks, each of which can be filled in or left empty. Figure 1 should help in visualizing this.

The character that matches this grid pattern, 16 possible, is POKEd into screen memory and the process continues until all 16 screen memory locations have been filled and the large character is formed.

Back to overlay mode. If the character already in screen memory is one of the block characters used to construct one large character, then an OR'ing effect takes place. This results in a new character being stored which represents a combination of the old and new screen codes.

If the character in screen memory is not a block character, it and the associated color memory byte are left unaltered.

This is a powerful capability that takes a little thinking to understand. It can be used to create a number of interesting special effects.

Alternating colors are created by the use of an upper case A followed by the two color codes to be alternated. For example, if the escape code is a slash, then "/A (GREEN) (RED) /ABCD" will result in a green A, a red B, a green C, and a red D. Any color code turns off alternating color mode and causes all subsequent characters to be printed in that color.

One final control character is a capital C, which stands for clear. Clear cancels any unusual character manipulations that may be in effect and results in subsequent characters being printed rightside up with no overlay and no inversion. C also turns off control mode just as though a terminating escape character were encountered.

ABOUT THE PROGRAM

The program on page 103 provides three different processing options. The demonstration is a sampling of some of the ways that *Bigprint* can be put to good use.

The view characters option allows you to key a character and then see how it appears enlarged, with a simultaneous display that includes both character sets, standard display, and reverse image. Press the space bar to cycle through the various display options. The CTRL key changes the color of the four enlarged characters appearing on the screen at any one time. Note that the coding for this uses a period as the escape character, meaning that the display will not change if you key a period.

The save option will write *Bigprint* to disk or tape with a program file name of your choosing. After this you can LOAD BIGPRINT from BASIC with the usual LOAD sequence, in which you account for the fact that BASIC reenters the program at the first line after doing a LOAD. Or you may avoid disrupting program flow by loading the saved subroutine in the following fashion:

```
POKE 147,0
SYS 57812 "name",8,1
SYS 62631
```

A FEW CONCLUDING NOTES

Bigprint stores directly into screen and color memory, bypassing the KERNAL PRINT routines. This is for lightning fast execution, as well as preservation of the BASIC pointers. *Bigprint* maintains its own internal pointers for this purpose but does not check for cursor controls or an excess of characters in a string that could cause storing of characters before or after screen and color memory.

The protection you do have is that the parameters on the SYS statement are validated at entry to *Bigprint*. An ILLEGAL QUANTITY error results if the starting line and position specifies an address that is lower than the start of screen/color memory, or such that the creation of one large character would go beyond normal screen/color memory.

The Kernal clear line routine entered at 59903 is sometimes useful for creating special effects with this subroutine. Simply POKE 781 with the line number (0-24) that you want to clear and then SYS 59903.

Most BASIC compilers will not properly handle SYS calls with this type of syntax. Therefore, if you intend to compile BASIC that uses this subroutine, you'll have to use the pass through mode of your compiler. With *BLITZ!* this means simply preceding the statement with two colons, as in ::SYS ml,"ABC",10,5. Check the instructions for your compiler to be sure.

The demonstration will show you some general ways in which *Bigprint* can be used, but the most creative applications will be those that you write yourself. View the demonstration to get some ideas and then have fun using this routine in your own programs. □

SEE PROGRAM LISTING ON PAGE 103

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STAR SEARCH

For the C-64



By Jim Sanders

Well, the IASA (International Aeronautics and Space Administration) has finally done it. For centuries they have made regular deposits of space garbage in the remote galaxy of Remus. The deposits have consisted of various types of used satellites, space labs, SIS's (Synthetic Intelligence Stations), spent retros and boosters, and sundry other space paraphernalia. And for centuries an interesting paradox has been gradually taking shape.

IASA and the world at large have depleted the supply of oress (the source of power for the 23rd century—the last source known to man) to dangerous levels. And tests have indicated a startling rise of oress units in the Remus galaxy.

A space exploration team was dispatched to investigate Remus and report to IASA the possibilities of retrieving the precious oress. The last report from the exploration craft brought the entire world to the point of despair. It was reported that the oress and the synthetic devices had combined in some sort of strange metamorphosis and produced oress-laden, intelligent stars which could perhaps present an even greater and more imminent threat to the future of the world.

As a last effort to save the known world Mission: Star Search was commissioned and dispatched to Remus with orders to both destroy the "smart stars" and recover the oress. You may be the most important person on the mission craft. You have the responsibility of operating the gamma-gun, the only weapon capable of destroying this threat to the human race.

As you approach Remus you see them: some moving from one place to another as if conducting some sort of business, some flickering as if conversing with one another. Some appear and suddenly are gone. The task seems overwhelming. Then suddenly your craft is hit by some strange force emitted by a star. Your mission is to destroy as many stars as possible and to retrieve at least 300 units of oress if your world is to survive.

As you gaze out your gamma-gun window your concentration grows to an intense level. You bring the power of your gamma to bear on the dangerous looking entities. You must be quick-handed as well as perceptive for this challenge. Your eyes are pulled in three directions—your craft damage indicator to the left of the window, your ammo monitor below, and your gamma-gun position for your attack on the smart-stars. The greatest hazard you face is the star force attack on your own craft. The damage indicator changes color to show the degree of damage. After several hits it will turn blue, and as you experience more abuse it will change to yellow, then red. Red indicates that complete destruction of you and your craft (and the world) is imminent. You can reverse some of the damage if you are a good shot. If you are able to destroy three stars in a row (that is, without a miss), you will nullify some of the damage to your craft.

Another potential hazard is the depletion of your gamma ammo. This can be replenished in the same way: by destroying three stars without a miss. Are you up to the task? I hope so, the world is depending on you. Good luck!

ABOUT THE PROGRAM

The program on page 113 is in two parts. *Star Search Boot* contains the ML portion, as well as a loader which loads *Star Search* (the main program). I suggest that you type *Boot* first and save it to disk or tape. If you are using tape, change the device number in line 60 of the loader program to a "1". Then type in *Star Search* and save it to disk or in sequence on the tape after the loader program. You *must* save it under the name "Star Search".

When you load and run *Star Search Boot* the ML will be POKEd into memory. If all is well with your typing, *Star Search* will automatically be loaded and run.

FINAL NOTES

As you view your screen and peer out the star craft window, strange sensations take place in your head. With a little imagination you find yourself really looking out the side window of your craft watching the stars and other "space garbage" stream by. So if your stomach feels a little queasy or you feel a bit lightheaded, just turn your head away from the window for a moment.

If you would like to alter the "playability" of *Star Search*, you could change the following items:

1. The number of oress units for victory in the conditional statement in line 1860.

2. The level of damage to your craft before destruction in lines 380 to 410.

3. Memory location 49633 is part of a timer in the sprite movement ML routine. The smaller the contents of this location the greater the speed of the star sprites (and your craft). This value is normally 20.

I hope you enjoy *Star Search*. It was fun and interesting to design. I realize the program is fairly long but I believe you will find it worth the effort to type it in. Or if you are basically lazy like me you may order *Ahoy!*'s disk. Good luck.

PS: To insure the proper loading, be sure to save the second program under the name "Star Search." □

SEE PROGRAM LISTING ON PAGE 113

Reader Service No. 186

FAILSAFE

Automatic Save Routine for the C-64

By Buck Childress

I couldn't believe it! A few nights ago the power went out. Oh, that part I could believe, especially considering it was a stormy winter night in the Pacific Northwest. What I had trouble swallowing was the fact that both my datasette and disk drive were ready to protect the program I was working on, and I hadn't made a safety save in over five hours! I got a lump in my throat about the size of 38911 empty bytes. The program, five hours of work, and a few more gray hairs went to that Great Microchip in the Sky.

I kept telling myself it was just one of those things and that, after all, I'm only human. But, as I glumly remembered what my trusty datasette and disk drive are for, I couldn't help feeling like the proverbial south end of a north bound horse. With that thought firmly implanted in my shattered mind, and with all the bravado I could muster, I vowed that it would never happen again. So, out of the gloom of that cold January night, *Failsafe* was born.

Failsafe automatically saves your BASIC program to disk or tape every 15 minutes. It works all by itself so you don't have to concern yourself with it at all. Just enjoy your programming and presto...every 15 minutes your latest version is saved. No more marathon sessions hurled into oblivion (no more hair falling from the head!).

Failsafe is a machine language program that uses an area of RAM from 49152 to 49632. Since this area is separate from BASIC RAM, you can load, save, and run programs (provided they don't put data in *Failsafe*'s territory) with no interference.

After saving a copy of *Failsafe*, run it. The loader will POKE the data into memory and check for errors. Should any be encountered, the corresponding line number will be given. If all is well, away you go.

Type SYS 49152, then press RETURN. The screen will clear and you'll be asked whether you're saving to disk (D) or tape (T). After pressing the appropriate letter, the rest of the word will appear, verifying your choice. Then you pick a starting number, from 00 through 99. If you choose a number that's less than 10, you still need to enter two digits. As an example, if you want to start at one, enter 01. Now press RETURN. Next, you're asked to enter the name, which can be up to 14 letters long. (*Failsafe* only accepts letters for the name.) After you enter a name, press RETURN. If you don't want to use a name, just press RETURN before entering anything. If you make a mistake entering any of this information, press the INST/DEL key. *Failsafe* will take you back to the beginning. Remember, you don't have to press RE-

Reader Service No. 183

TURN after entering D or T (for disk or tape), but you do have to press it after entering the starting number and name. (This gives you a chance to press INST/DEL if you goof.)

When everything has been entered, *Failsafe* activates itself. Should you want to make a change once *Failsafe* is active, you'll need to deactivate it first. Type SYS 49152, then press RETURN. A message will appear telling you it's off. Now SYS 49152 to start over. As you can see, SYS 49152 turns *Failsafe* both on and off. (I figured my hair was falling out fast enough without having to remember a bunch of different SYS locations.)

That's all there is to it. After 15 minutes have elapsed, *Failsafe* will wait for the RETURN key to be pressed. It won't make a save while you're in the middle of programming a line. Once the RETURN key has been pressed, the screen border will turn medium gray (color 12) for about three seconds. During this time you can press the RUN STOP key if you want to cancel the save. (Perhaps you haven't added anything new to your program since the last save, or maybe you want to tempt fate one more time.) If the RUN STOP key isn't pressed, the save will take place. After saving, or cancelling, the screen border returns to its original color (*Failsafe* initially sets it as light blue–color 14) and the timer resets for 15 minutes.

When a save is made, the version number will be tacked on before it (e.g.: 44PROGRAM). Then the number is incremented by one. The next save (using our example name and number) would appear as 45PROGRAM. Should the number exceed 99, *Failsafe* automatically resets to 00.

If you're using a disk drive, all you have to do is leave it on. With the datasette, you'll see the message "PRESS RECORD & PLAY ON TAPE". After you've done so, and the save is completed, leave the buttons down (the datasette won't run until the next save). All future saves will be completely automatic.

You can make a save before 15 minutes are up by typing SYS 49325, then pressing RETURN. Providing *Failsafe* is on (if it's not you'll just get the READY. message), the latest version of your masterpiece will be saved, the version number incremented, and the timer reset. If for some reason you want to save something in the conventional manner (e.g.: SAVE"PROGRAM",8 for disk, or SAVE"PROGRAM" for tape), it's perfectly okay with *Failsafe*. Remember, though, if you use a conventional save, the number won't be incremented and the timer won't be reset.

Failsafe won't try to make a save when you're listing, loading, saving (in the conventional manner), or verifying programs. If you happen to be using an ML monitor, *Failsafe* won't save while you're working with it. In other words, it never gets in your way. It only saves when it's supposed to. If you plan to run your programs, you should deactivate *Failsafe* first.

Give *Failsafe* a try. It'll keep those "WHY DIDN'T I SAVE IT?!" blues away! □

SEE PROGRAM LISTING ON PAGE 112

ENGLISH DARTS For the C-64



By Michael E. Townsend

With the popularity of the new electronic dart games in pubs today, you can brush up on your aim before taking on the pros on your evening out with a home version of English darts.

This program allows you to choose between the standard '301' game or the extended '501'. Up to seven players may participate at one time, making it an ideal home party game. Rules are the same as with ordinary board darts, with the advantage being that you don't scar up your walls with your overthrows! There are three throws per player per round: to win, an exact score must be made or you will 'break' and return to your previous score.

Type in the program on page 117 and save it to disk or tape. Type 'RUN' and the billboard will appear following the loading of data. Choose the game you wish to play and the number of players. The game will automatically prompt you as to which player is up.

The screen will clear and the program title along with six informational boxes will appear at the top of the screen, plus a listing of each player's current score in the lower right hand corner. The dartboard will appear, as well as a dart moving up and down on the left hand side of the screen. To throw a dart, simply press any key.

Scoring is from the center of the board (a bull's eye for 50 points) to the outer edges of the board (from 20 down to 1 point as you advance to the edge). You may also score double and triple points as in the real board game: the computer will evaluate your throw randomly.

Following each round, a 'box score' is presented with the current standing of each player.

When a person has won, you will be prompted as to whether you wish to see the final scores, as well as asked if you wish to play again.

When typing in the program, you may delete all 'REM' statements and numbers immediately preceding and following them. ☐

SEE PROGRAM LISTING ON PAGE 117

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1571 OR 1541?

Many times a C-128 programmer needs to know what kind of disk drive a user has. Here's a simple way to do it:

```
10 DISK=1541:POKE2588,0:DOPEN#2,"*":CLOS
E2
20 IF PEEK(2588) THEN DISK=1571
```

The programmer may wish his program to use fewer disk operations if the user has a slower disk drive.

–Bruce Jaeger
St. Paul, MN

EASY DIRECTORY READER

This short and sweet subroutine will read up to 70 entries from the directory and store them in the variables A$ (program names) and C$ (file types). It can be used as a directory reader or as a subroutine which can LOAD programs off the disk (they auto run if so loaded) or as a utility to, for example, erase all sequential files.

–David Rostcheck
Mendon, MA

```
·10 DIMA$(70),C$(70):OPEN1,8,0,"$0"
·20 GET#1,B$:IFSTTHEN70
·30 IFB$<>CHR$(34)THEN20
·40 GET#1,B$:IFB$<>CHR$(34)THENA$(X)=A$(X
)+B$:GOTO40
·50 FORY=1TO(17-(LEN(A$(X)))):GET#1,B$:NE
XT:FORY=1TO3:GET#1,B$:C$(X)=C$(X)+B$
·60 NEXT:X=X+1:IFST=0THEN20
·70 CLOSE1
·80 FORC=1TO70:PRINTA$(C)TAB(20)C$(C):NEX
T:PRINTX
```

PAUSE 64

Here's a handy utility that will cause your C-64 to pause whenever the CTRL and P keys are pressed simultaneously. This is most useful for halting a program listing, but it will also halt a running BASIC program as well. Some machine language programs can be halted too, if the ML has not dismantled the pause utility. The program below will install *Pause 64* in memory at 50176 to 50264 ($C400-C458). If you wish, it will also save the utility to disk (for cassette, change the 8 in line 220 to 1). After this you don't need the BASIC loader; just enter LOAD "PAUSE 64",8,1 and then NEW. To LOAD the utility without NEWing an existing program in memory enter POKE 147,0:SYS57812"PAUSE 64",8,1:SYS 62631 and then hit RETURN. This will load *Pause 64* without upsetting BASIC pointers. After the utility is in memory, connect it with SYS50176. Thereafter CTRL-P will cause your C-64 to pause whatever it is doing (e.g., scrolling a listing). CTRL-C or C will allow the computer to continue. Use SYS 50213 or STOP/RESTORE to disconnect the utility.

Pause 64 is an IRQ wedge routine that, when it detects CTRL-P, sets up an infinite loop that JSR's to the Kernal SCNKEY routine. Each time around it checks for C. When it detects C it exits the loop and returns control to the program that was interrupted.

–James C. Dunavant
Gainesville, FL

Reader Service No. 164

```
·100 FORI=50176TO50264:READA:POKEI,A:C=C+
A:NEXT
·110 IFC<>8949THENPRINT"[DOWN] ERROR IN D
ATA STATEMENTS!":END
·120 PRINTCHR$(147)"[DOWN] PAUSE 64 INSTA
LLED"
·130 PRINT"[DOWN] SAVE PAUSE 64 (Y/N)?"
·140 GETH$
·150 IFH$="Y"GOTO180
·160 IFH$="N"THENGOTO210
·170 GOTO140
·180 SYS57812"PAUSE 64",8,1
·190 POKE193,0:POKE194,196:POKE174,89:POK
E175,196
·200 SYS62957
·210 PRINT"[DOWN] SYS50176 TO CONNECT"
·220 PRINT"[DOWN] SYS50213 TO DISCONNECT"
·230 PRINT"[DOWN] CTRL-P TO PAUSE"
·240 PRINT"[DOWN] CTRL-C TO CONTINUE"
·250 DATA 173,46,3,201,15,240,29,169,15,1
41,46,3,173,20,3,174,21,3,141,52,3,142
·260 DATA 53,3,120,169,64,162,196,141,20,
3,142,21,3,88,96,173,46,3,201,255,240
·270 DATA 19,169,255,141,46,3,120,173,52,
3,174,53,3,141,20,3,142,21,3,88,96,173
·280 DATA 141,2,201,4,208,15,165,197,201,
41,208,9,32,159,255,165,197,201,20,208
·330 DATA 247,108,52,3
```

TWO DRIVE DETECT FOR THE C-128

This routine will automatically determine how many disk drives are online with the C-128. Use it as a subroutine in your programs that use more than one drive. Call it at the beginning of your program.

```
10000 FOR I=8TO11: DOPEN#15,"I0",D0,U(I)
:DCLOSE#15:IF ST<>0 THEN POKE 4866,I-1:G
OSUB(disk error subroutine):RETURN
10010 NEXT:GOSUB(disk error subroutine):
RETURN
```

The number of drives is stored in location 4866 and may be used as a variable in any command to access the disk drives.

—Steve Hoult
Wyoming, MI

```
100 DV = PEEK(4866): DLOAD"Program Name"
D0,U(DV)
```

BASIC EOR

The following short BASIC code performs a logical exclusive OR (also known as EOR or XOR):

```
·10 ML=828:AC=780:REM ML IS RELOCATEABLE-
AC=ACCUMULATOR
·20 FORI=0TO2:READ A:POKE ML+I,A:NEXT:DAT
```

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Reader Service No. 184

```
 A 73,X,96:REM X=EOR VALUE
•30 POKE AC,VAL:SYS ML:VAL=PEEK(AC):REM V
 AL IS NOW EOR'ED WITH X
```

Actually, this is more like machine language than BASIC; the first value in the DATA statements (73) is the 6510's OP code for EOR. The variable AC is the storage location for the accumulator, so what we're really doing is this:

```
LDA #VAL  ;BASIC's POKE AC,VAL
EOR #X    ;SYS ML/VAL=PEEK(AC)
```

To see a quick example of what this can do, enter lines 10 and 20 and RUN them. Then enter this line in direct mode:

```
FORI=1TO5:FORJ=0TO39:POKEAC,PEEK(1024+J)
:SYS ML:POKE1024+J,PEEK(AC):NEXT:NEXT
```

This is also quite useful when working with sound or sprite registers where "bit flipping" is a common occurrence. —Matthew R. Strange
Mansfield, PA

EPYX DRIVE SWITCH

If you're using the Epyx *Fast Load* cartridge with two disk drives, there is a location in memory that you can change to allow the cartridge to know which drive you wish to use. Just POKE location 186 with the device number of the drive that you want activated. Location 186 holds the current device number. POKEing this location with the device number of your extra drive allows you to switch between drives. The default for this location is 8. —Larry Mudge
Winnipeg, Manitoba

WINDOW INPUT

You can use the WINDOW command on the C-128 to put a limit on the length of keyboard INPUT. So long as the combined length of prompt and response doesn't exceed one screen line, this little routine works beautifully.

In the following example, the limit is 16 charactes. If the user tries to enter a 17th character, the line clears and the cursor is returned, forcing him to start his INPUT over. To use this in your own programs, simply change the variables in line 1000 to suit your needs.

—R. Harold Droid
Seattle, WA

```
•1000 PR$="FILENAME: ":LE=16:REM TEXT OF
 INPUT PROMPT AND MAXIMUM INPUT LENGTH
•1010 LN=PEEK(235):OPEN3,0:PRINTPR$;:WIND
 OWLEN(PR$).LN,LLEN(PR$)+LE,LN:INPUT#3,A$
•1020 CLOSE3:PRINTCHR$(19)CHR$(19):LN=LN+
 1:IFLN>24THENLN=24
•1030 POKE235,LN
```

SKI FOLLY

For the C-64

By Kevin Brown

After what seemed like an eternity, you were finally rewarded with that well-deserved vacation. You fully expected to spend a restful week at the Mt. Kendall Ski Lodge; skiing and romantic evenings by a fireplace were all that were on your mind. When you slipped into your ski jacket, the thought that you'd soon be desperately attempting to save your life never occurred to you. *Ski Folly* is a magnificent simulation of the deadly situation you find yourself in. You've accidentally gotten on "Dead Man's Slope!".

This arcade-style action game starts out with an attractive title screen followed by another equally attractive instruction screen that completely explains the game. After pressing the fire button of the joystick in port 1, the game screen appears and the action begins. The object of the game is to survive the journey to the end of the slope, a difficult task by itself; however, to score well, you must do this in the shortest amount of time possible. The rate of speed at which you fly down the slope is not controlled by you. The slope steepens as you progress towards the end, and the speed increases as this occurs. The only control you have is which direction you head in (left or right) and a semi-efficient system of slowing yourself down; but this has some adverse effects on your score. When the brakes are used, the distance to the end of the slope remains the same, but the timer continues; heavy use of slowing down can ruin your chances of a serious score. Also, if you don't have a joystick or would prefer to use the keyboard, just use the ConTRoL key for left, the 2 key for right, and the space bar to slow down. (Remember that last one!)

Most C-64 owners would glance at the program, notice that it was in BASIC, and give up on any hope that it might be worth typing. I agree; if it were entirely in BASIC, it *wouldn't* be worth typing. You see, this game requires the fast moving action of many sprites, which would jerk in BASIC. So short ML routines are read into memory to take care of this, thus shortening the program length besides speeding it up. An interrupt routine in machine language moves your man without the aid of endless BASIC program lines. You can observe this for yourself; when the program prompts you to press the fire button on the instruction screen, just hit RUN/STOP and then move the joystick around. As you can see, the routine moves the skier no matter what else the program may be doing. Another routine scrolls the sprites during the game; attempt to press RUN/STOP while the trees you're supposed to avoid are scrolling down the screen. In effect, with these routines the program can do two things at once.

The fast action, challenging object, fine graphics and sound effects, and endless other gameplayer's luxuries of *Ski Folly* make it one that any computerist should have in his program library. □

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PROGRAMMERS' BASIC TOOLKIT
Epyx, Inc.
Commodore 64
Disk; $34.95-$44.95

Epyx has taken some of the most commonly desired commands and functions omitted from Microsoft's BASIC 2.0 and incorporated them into a package that also adds a sprite animator/generator and a background/font editor. Designing sprites and alternate character sets is simplified tremendously. Laying out a background for sprites to move on is as easy as picking characters from a menu and laying them down on a blank screen.

The Macintosh-type user interface with pull-down menus and joystick pointer are easy to use, though the resolution isn't nearly as fine. When choosing the options from the pull-down menus, it's easy to overshoot the bottom of the menu, causing it to go back up. But because this doesn't take long to get used to, the menus are an asset.

The documentation would have been improved by inclusion of a sample programming session. The reference summary with its command listing and descriptions helps considerably. Sample programs on the disk adequately demonstrate how completed programs look, but offer few hints as to how they were created. A command summary card acts as a handy reference guide. Help files are included on the disk.

Programs created with the *Toolkit* are not self-sufficient. They must be run from a specially created "autoboot" disk or after the *Toolkit* has been loaded. These disks load fairly quickly considering the amount of material being loaded. With the Vorpal Fast Loader, included on the disk, the *Toolkit* itself loads in quickly, too.

So exactly what did they add?

First, direct commands like automatic line-numbering, renumbering, a disk directory, LPRINT, and LLIST. The last two list the program or line to a printer instead of the screen; no OPEN, CLOSE, or CMD commands needed. A find and replace command called CHANGE will find all occurrences of a word and change them to whatever you designate. A FIND command will list all lines containing a user-chosen string (great for checking all your GOSUB and GOTO lines). Function keys are easily reprogrammed using a KEY command. And just in case you really mess it up, there's an UNNEW command.



Wrench more power from BASIC 2.0.
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They added programming commands such as PRINT AT, an ELSE statement to accompany IF/THEN clauses, DO <procedure>, JOY (checks joystick position), and a WINDOW statement. The DO and PROCEDURE commands are similar to those used in PASCAL programming. Drawing commands like LINE, CIRCLE, BOX, DOT, and FILL make it easier to create graphics on the screen. The VOICE and SPRITE related commands give complete control of sprites and sound.

Though these commands add flexibility to the way programs are written, *Toolkit* goes even further. A sprite editor/animator and a background and font editor help the programmer illustrate his works. Sprites created and saved with the *Toolkit* can be called into programs with a simple SPRITE LOAD command. A variety of sprite commands help you locate, activate, move, and deactivate sprites.

For the old-fashioned types (or those who like to use machine-coded sprites), the sprite creation display includes all the numbers needed to identify and use your sprite. If you know the right places to poke the data, you can bypass all the *Toolkit*'s sprite commands, while still using the sprite generator to simplify the process.

Sprites can be high resolution two color or multimode four color creations. Multiple sprites can be tested in the animator to decide the best paths for them to take. Sprite movement is controlled using AT, MOVE, FREEZE, ON, OFF, ON BACKGROUND, and UNDER BACKGROUND commands. Special sprite collision commands can detect when sprites hit each other or the background. After detection, the collision detector is easily reset to register the next collision with a simple command. A sprite copy command can be used to create and manipulate sprites directly from BASIC.

The background and font editor allow easy text handling. Though called a background editor, this section does not allow the drawing flexibility of a program like *DOODLE!* or *Koala Paint.* You actually create the background using the C-64's graphics characters or those you've created. A translator provided on the *Toolkit* disk allows the use of *Koala Paint* files with the *Toolkit*, however. Three character fonts are included on the disk computer, Old English, and cursive. These (or the Commodore's built-in character set) may be modified and used at will. Commands to swap out the native character set for another make changing letters easy.

A printer dump is included, so sprites, text, and background and other illustrations can be seen in hard copy.

The windowing feature is also a nice addition. With it and its companion commands ROLL and SCROLL, text and graphics can be placed on the screen in layers. Graphics larger than the screen can be viewed in piec-

es in the window.

The sound and voice commands make it easy to incorporate sound effects and music. All three of the Commodore's voices are easily accessed. A sound clear function simplifies discontinuing ringing tones (one of the more difficult tasks on the C-64).

Suspecting that the *Toolkit* might bring Commodore 64 programs up to C-128 level, I made a feature-by-feature comparison and found almost no compatibility. The few commands shared by both versions don't generally perform the same functions.

The package is aptly named. A beginning user wouldn't know enough about programming to appreciate some of the features. An intermediate level programmer using this package would greatly speed up the creation process. An experienced programmer probably already has such tools available, though it is nice to have them all in one package. With the graphics and music aspects, this is a great package for game programmers.

Despite the package's claim of working with both the 64 and 128, like many similarly advertised programs it works only in the 128's C-64 mode.

Epyx, Inc., 1043 Kiel Court, Sunnyvale, CA 94089 (phone: 408-745-0700). *–Cheryl Peterson*

HELP MASTER 64

Master Software
Commodore 64
Disk; $19.95 (see below)

Help Master 64 is a memory-resident programming aid for BASIC. The meaning, use, and syntax of each Commodore BASIC command will appear on your screen when you type one special key followed by the BASIC command. Or, just type the special key and you get a list of all the commands.

Written in pure machine language, *Help Master 64* resides in portions of your C-64's memory that are not used by BASIC. It loads below the BASIC ROM into RAM from 40960 to 49151 and uses most of the 4K from 49152 to 52223. Using these locations, it is compatible with the DOS wedge, which sits in RAM from 52224 to 53247. *Help Master 64* should run with any pure BASIC program, but it will conflict with any machine language program that tries to use the same memory locations.

Help Master 64 uses this unrequired memory space so that it can be totally transparent to you. Once it is loaded and you have read its five introductory screens, which you can bypass when you are familiar with the program, nothing about the operation of your computer or the appearance of the screen will hint that *Help Master 64* is even there.

That is, until you need it. When you have forgotten the abbreviation of a BASIC command, cannot remember it's exact syntax, or want more information on the command, *Help Master 64* instantly comes to your rescue. Just type a quote followed by the BASIC command and RETURN. *Help Master 64* will display, on the top 13 lines of your screen, the information you need. The program lines you are working on will still show on the lower half of the screen.

Before we see exactly what is displayed, what happens to that top half of your screen? The program you were writing, or at least 13 lines of it, was there. True to its name, *Help Master 64* restores your screen to its original appearance after you have the help you need. No muss, no fuss, the *Help Master 64* overlay just disappears.

Now what exactly does *Help Master 64* tell you? Within those thirteen lines are five lines used just for spacing, one to tell you this is a *Help Master 64* display, and one to tell you how to exit. That leaves six lines of real information, so do not expect a sample program showing you how to use the command.

The first line of information lists the BASIC command and its Commodore abbreviation. The second gives proper syntax for the command with optional parameters in [brackets]. Up to three more lines describe the command, give options, and list system defaults. The last line of information gives page numbers of reference books where you will find more information. Those references include the *C-64 User's Guide* (both old and new versions), the *C-64 Programmer's Reference Guide,* and the *Handbook of BASIC for the C-64.*

Of the 69 commands on which *Help Master 64* can provide information, 4 span two screens and 38 are linked to companion commands so

you can get more information just by touching a function key. ON, for instance, can take you to GOTO, then to GOSUB and RETURN.

An example of the information provided is:

POKE Abbrev P Shift O
Syntax POKE M,V
Store the value V in memory location M.
M must be in range 0 thru 65535.
V must be in range 0 thru 255.
Guide 123/177:PRG-REF 69: Handbook 167

If you have already begun your programming effort for the day, you can still load *Help Master 64* without saving and reloading your program. A special version of *Help Master 64* can load around your program. Before it runs, you must type three commands: NEW, SYS51250, and CLR. The first wipes out your program, the second restores it, and the third gets you under way again.

The SYS51250 command is always available in *Help Master 64*. It will restore a NEWed program, one that has been zapped by a warm start (SYS64738), or one wiped out with a hardware reset switch.

Help Master 64 by itself costs $19.95. With a BASIC handbook it costs $24.95. Buy the package. The *Handbook of BASIC for the Commodore 64* from Brady Co. (read that Prentice-Hall) is softbound and spans 359 pages.

The *Handbook* includes 9 pages of introductory material on programming, 238 pages of alphabetized BASIC commands, statements, and functions, 25 pages on sprites, and 12 on music synthesis. It concludes with 19 useful appendices on character sets, colors, disk commands, data files, memory allocation, printer codes, RS-232, graphics, sound, etc.

For each BASIC command you get a description, an example, comments (how to use the command), and applications (when to use it). This book is full of demonstration programs—as far as I am concerned, the only way to understand BASIC commands. For POKE, the two examples show how to change screen background and border colors and how the music synthesis chip can be used as a warning beeper.

This program has an unusual rebate offer. Each of your friends who buys the program and mentions your serial number earns you a $2 credit. For each $2 credit that friend earns, you get a $1 credit. Each year, anyone with $10 or more on the books gets a check for the full amount.

Help Master 64 will be a wonderful aid for beginning and intermediate BASIC programmers. Somewhere in the intermediate stage, I suspect that some of you will pick up one of the several good BASIC extensions on the market. These extensions give you many more BASIC commands to improve and ease your control of graphics, sound, and data files. By the time you are ready for these, you may have outgrown *Help Master 64*, and it will not help you with the new commands anyway.

Help Master 64 will help you write your own programs and make sense of programs you type from *Ahoy!* (Even when you do not understand everything you type, this is a great way to become familiar with good BASIC programming technique.) Do I recommend *Help Master 64*? Yes. If you outgrow it quickly, it will have done its job of helping you learn.

Master Software, 6 Hillery Court, Randallstown, MD 21133 (phone: 301-922-2962). *—Richard Herring*

BASIC 128
Abacus Software
Commodore 128
Disk; $59.95

BASIC 128 is Abacus Software's *BASIC 64* compiler redesigned and improved for the 128. Like the earlier version, it's an import from Europe. Since Europe usually gets new Commodore machines first, they get a head start on programs like compilers and other programming tools, which Abacus has been importing for several years. Like those before it, *BASIC 128* is an attractive product at a good price.

BASIC 128 will compile programs to either pseudo-opcode or machine code.

The pseudo-opcode runs faster than normal BASIC, but occupies more disk space. The machine code runs a bit faster than the pseudo-opcode.

The documentation is unimpressive at first glance, but further study reveals that it is a gold mine of hints and tips for speeding up your programs. There are a couple of sample programs to demonstrate the advantages of compiling. They are careful to point out that compiling generally doesn't speed up programs that contain few mathematical procedures. Sorts and manipulations of numbers are quickened; screen intensive activities are barely changed.

A whole chapter is devoted to optimizing your code for maximum speed. In addition, *BASIC 128* has a few optimizers built in. One is an alternative way to handle the "garbage collection" function. According to Abacus, it limits even the worst collection to under a second's time.

One section even outlines some undocumented features of BASIC 7.0, such as using relative coordinates with some of the graphics commands. Unfortunately, the compiler doesn't take advantage of these directives. It seems that BASIC 7.0 isn't entirely compatible with its documentation.

Should there by any problems while compiling, coded error messages are displayed. These are all explained in one section, so they're easy to find. Errors that occur during the running of the compiled program are identified just as they would be if an uncompiled program were running, but instead of giving line numbers for the errors, *BASIC 128* programs return memory locations. This would make it very difficult to debug a program, but *BASIC 128* will print a list of locations and the line numbers to which they correspond.

Errors that occur during compilation don't usually stop the process. In this way, you can get a list of all the errors that need attention in one pass. Disk errors are the exception. If a disk error occurs, the program stops compiling and delivers the error message.

If used with the 128 in 80-column mode, *BASIC 128* boots up in FAST mode. This does greatly improve the speed over compiling using 40 columns. Long programs can take "hours" to compile (or so it seems).

Another advantage is its simplicity. While it is complicated enough for programmers who use overlays and assembly language sections, it is also simple enough for a novice who wants to compile a simple magazine program. For a simple compile, the whole process requires only six steps once you've got the BASIC program debugged.

The BASIC program to be compiled must be saved as a file on disk. *BASIC 128* must be loaded in from its disk. The disk with the source program on it must be swapped into the drive. The RETURN key is pressed to choose the "Compile to P-code" option. The name of the program to be compiled must be entered. When it's finished, you type "N" to quit the compiler.

Two extra steps are required to compile to machine code: choosing option 3 from the opening menu, and pressing the "A" key and RETURN. This activates the machine code compile option.

BASIC 128 is a two-pass compiler. The first pass interprets and optimizes the code and then creates the P-code. The second pass reprocesses and completes the compiling, adding the run-time module and data lines. As it does its work, it keeps you updated on its progress via screen messages. When it finishes the compiling, it gives the memory locations of data word, object code, strings, and extensions. If there were any errors, these too will appear on the screen.

A few of the 128's commands cause a little trouble and require special compiler directives inserted into the program before compiling, most notably the COLLISION command and commands that use variables for line numbers. Some others that cause difficulty are compiler directives.

Some of the Pascallike functions can also cause trouble if used incorrectly. IF...THEN...ELSE can BEGIN...BEND have to be handled carefully. A good programmer won't be thrown by this at all.

While being easy enough for a novice, *BASIC 128* still has features that will please the more experienced programmer. From allowing the use of

some BASIC extenders to handling overlays, it has some powerful features. If you need a compiler and have some idea of why you need one, this one will probably do the job. At $59.95, it is certainly not overpriced.

Abacus Software, P.O. Box 7211 Grand Rapids, MI 49510 (phone: 616-241-5510). *–Cheryl Peterson*

ORTHO'S COMPUTERIZED GARDENING

Ortho Information Services
Commodore 64
Disk; $49.95

One frequent complaint made about software packages is that they assume you know what you're doing before you start to operate the program. The documentation that results when a software publisher makes this assumption is frequently minimal, and the user finds himself falling in holes because he doesn't understand fundamental concepts that the documentation fails to explain. While gardening deals with many holes, there are none in Ortho's documentation.

In fact, their idea of documentation is a complete course in gardening supplemented by a user's manual for the software. A 192-page book explains most of the major considerations that go into creating a garden. From analyzing soil content to starting seedings to dealing with pests, this book covers it all. Similar books on gardening run between $15 and $25 at a bookstore.

The included planting guide illustrates the planting zones in the US and tells when vegetables should be planted for each zone. A landscape planner is included to help you lay out the gardens you'll want to plant. There's a small guide to growing flowers that briefly touches on choosing the kinds of flowers to plant. This is where the software comes in. The Ortho Personalized Plant Selector makes it easy for you to choose plants that will thrive in your geographic area. When you enter your zip code, the program searches its database and tags the files of plants that will do well for you.

The program is so well designed it barely needs documentation. Com-

pletely menu-driven, it is almost too easy to use. With help files available on the disk, it's almost impossible to go wrong.

The database can be searched for a number of parameters, making it very convenient to plan out your flower beds and landscaping (see figure 1). Using the blooming season option, you could for example create a list of plants that bloom in the summer for a bed along the driveway.

Using the "MAKE A PERSONALIZED PLANT LIST" option, you can search the database using any or all of the criteria simultaneously. If you are planning a colorful display and want to use annual flowers of varying heights less than a foot, you could search through setting the TYPE option for annuals and the HEIGHT option at 12 inches or less. By not specifying a color, all colors are displayed. The listing that is returned is easily printed out.

This list then becomes a directory to the database. By highlighting a

Figure 1: Main Menu

```
Ortho's Personalized Plant Selector
Main Menu

1  List by BOTANICAL Name
2  List by COMMON Name
3  List by TYPE
4  List by HEIGHT
5  List by FLOWER COLOR
6  List by BLOOMING SEASON
7  List by LIGHT REQUIREMENTS
8  List by WATER REQUIREMENTS
9  Make a PERSONALIZED PLANT
   LIST
0  PRINT a plant list
?  HELP
-  Exit Program

Enter a number or a botanical name
>
```

name and pressing the RETURN key, all the information on that plant is displayed (see figure 2). Noting the heights of the flowers, you could choose one of each color and be sure each is a different height. Because it's easy to print the information, you can be printing a listing of flowers that meet your requirements as you go along (see figure 3).

While the database makes it easy to find plants to suit your needs, the

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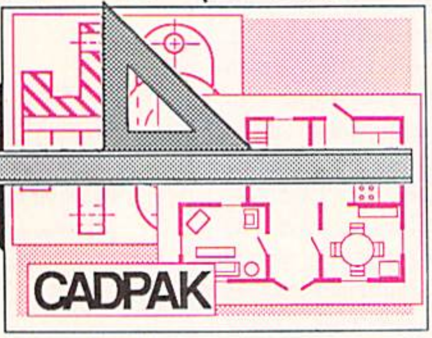


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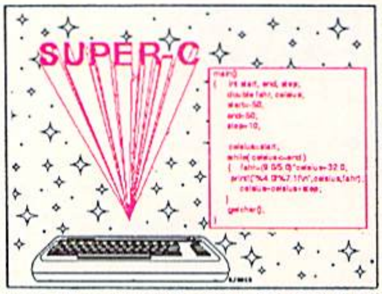


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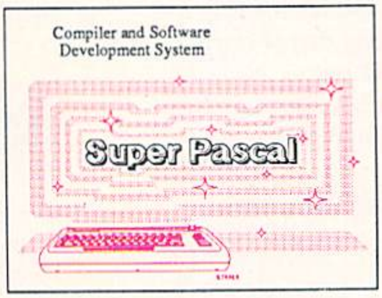
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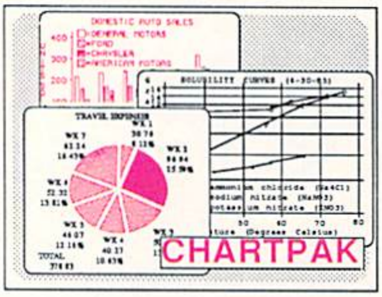
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package also helps you track steps in landscaping projects. The calendar option lets you enter notes on tasks that need to be performed on specific days. On a separate data disk (which the program will format for you), calendar entries are stored by month, day, and year. This section is amazingly simple to use; much like writing a reminder on a calendar.

Figure 2: Personalized Plant List

Select from list

Gardenia jasminoides prostrata
Hedera canariensis
Hedera helix
Juniperus conferta – g'cover
Juniperus procumbus
Lantana montevidensis
Liriope muscari
Liriope spicata
Ophiopogon japonicus
Trachelospermum asiaticum
Trachelospermum jasminoides
Vinca major

Point to name and select or type name here >

A separate notepad function lets you write notes for special plant care, shopping lists, unscheduled tasks; just about anything you like. These too are easily printed. Using the menu provided, you can even edit your calendar entries without leaving the notepad.

If that's not enough, a calculator is built in. Though it only provides simple math functions, it can come in handy for figuring out square footage of sod needed or approximate costs for shopping trips. Nice addition!

Figure 3: Plant Information

Pelargonium Domesticum

Botanical Name:
Pelargonium Domesticum

Common Name:
Palargonium
Martha Washing'n Geranium

PLANT TYPE: Tender Perenial
height: 1½ to 3 ft.
soil: Good drainage
light: Full Sun to light shade
water: Medium water
feeding: Light feeder
blooming time: Spring to Summer
flower colors: Lavendar, Pink Purple, Red, White

Comments: In warm weather, water deeply once a week.

Last and not least, the program doesn't seem to be copy protected. Using the simple copier provided with *Fast Load* gave me working copies of the disks' two sides. Since data must be written to the disk to personalize it for your zip code area, this is an important factor.

Definitely developed for the "home market," a lot of thought went into making this a worthwhile package. It is certainly worth a look by anyone who is serious about improving their botanical surroundings. A small landscaping firm could probably use it to help plan projects, so a home owner should certainly find its features useful.

Ortho Information Services, P.O. Box 7144, San Francisco, CA 94120-7144 (phone: 415-894-0277).

–Cheryl Peterson

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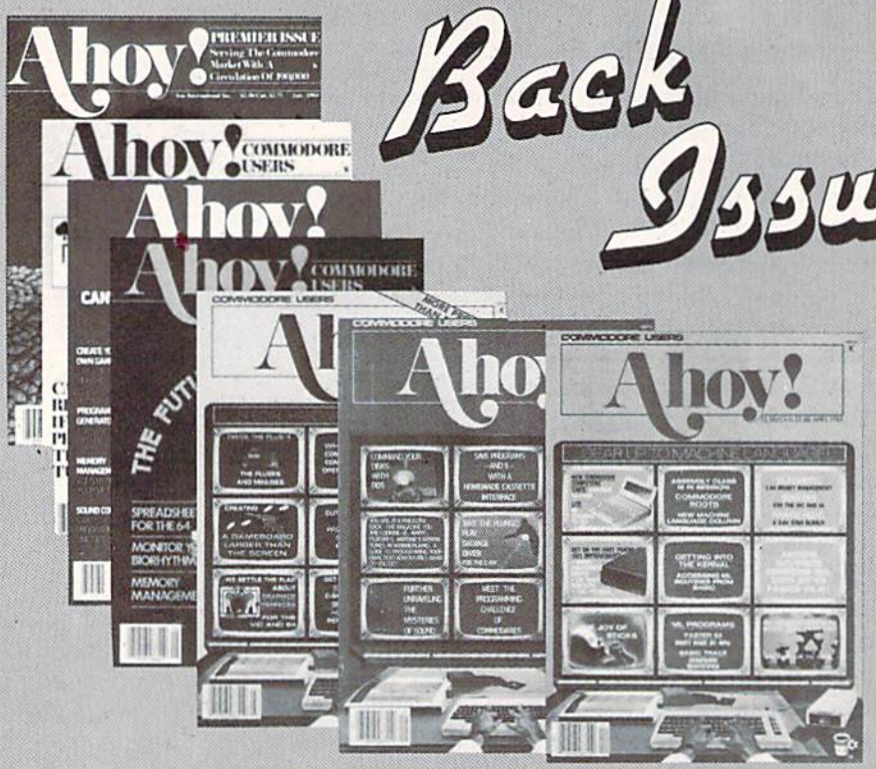
The Walker

1) Insert your COMAL disk in drive*.
2) Type LOAD "C64 COMAL*",8
3) Type RUN (starts COMAL)
4) Type AUTO
(COMAL provides the line numbers)
5) Enter the program lines shown below
(COMAL indents lines for you)
6) Hit RETURN key twice when done
7) Type RUN
Watch an animated sprite hobble across the screen. Change the (99) in line 450 for really fast walking

```
0010 setup
0020 repeat
0030   walking
0040 until key$="q" //Q to Quit
0050 //
0060 proc setup
0070   blue:=14; pink:=10
0080   white:=1; black:=0
0090   define'images
0100   repeat
0110     input "speed (1-10): ": speed
0120   until speed>=1 and speed<=10
0130   background black
0140   setgraphic 0
0150   spriteback blue,pink
0160   spritecolor 1,white
0170   spritesize 1,false,false
0180   plottext 1,1,"press q to quit"
0190 endproc setup
0200 //
0210 proc define'images closed
0220   dim shape$ of 64, c$ of 1
0230   shape$(1:64):=""
0240   shape$(64):=chr$(1)//multicolor
0250   c$:=chr$(0)
0260   for x=22 to 63 do shape$(x):=c$
0270   c$:=chr$(170)
0280   for x=1 to 21 do shape$(x):=c$
0290   define 0,shape$
0300   c$:=chr$(20)
0310   for x=22 to 42 do shape$(x):=c$
0320   define 1,shape$
0330   define 3,shape$
0340   c$:=chr$(60)
0350   for x=43 to 63 do shape$(x):=c$
0360   define 2,shape$
0370 endproc define'images
0380 //
0390 proc walking
0400   for walk:=1 to 319 div speed do
0410     x:=walk*speed
0420     y:=100+walk mod 4
0430     spritepos 1,x,y
0440     identify 1,walk mod 4
0450     pause(99)
0460   endfor walk
0470 endproc walking
0480 //
0490 proc pause(delay) closed
0500   for wait:=1 to delay do null
0510 endproc pause
```

* If you don't have COMAL yet, order a Programmer's Paradise Package-$19.95. It includes the complete COMAL system plus over 400 pages of information. Add $5 more to get our 20 interactive lesson Tutorial Disk. Add $2 shipping. Visa/MC or US funds check accepted. Send to:

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More BASIC Programming



Including *Alchemist's Apprentice*, A Program for the C-64, C-128, and Plus/4

By Cheryl Peterson

This month we have a little exercise in BASIC programming to show how to structure a program using the ON-GOSUB command. We'll put together a program called *Alchemist's Apprentice* and see how it works. We'll use a randomizing function to make our game unpredictable. We'll use a timing routine to keep track of how much longer our players can continue. We'll use both GET and INPUT statements to take keyboard input. Though I'll be explaining the main parts of the program, there are several subroutines that I will leave you to figure out.

Since I've always preferred to communicate using words instead of pictures, *Alchemist's Apprentice* doesn't use fancy graphics or sprites. If you'd like to, you could write some graphics routines to illustrate the program.

There are lots of books available on BASIC programming that explain the use of different commands, and I'll have a list of some of them at the end of this month's column. But what the beginning programmer needs to know is how to organize a program. The actual technique of writing a program involves much more than knowing which commands to use. Let's take a look at one person's approach to programming: mine.

To write *Alchemist's Apprentice*, I first thought about what I wanted it to do. With notepad in hand, I sat down and started writing the basic plot.

> The alchemist has gone away to a convention. As his apprentice, the player is just learning how to change stones into gold. The alchemist has demonstrated most of the process, but keeps the key ingredient secret. The player must figure out what the ingredient is. The object of the game is to change as many stones into gold as posble before the alchemist returns from the convention. Unless the gold is hidden out of sight before the alchemist returns, he'll take the player's gold away. The alchemist also expects the shop to be cleaned up before he returns.

Some of my options at this point in the program's development were more complicated than I wanted to get. I didn't want to write a parser to figure out exactly what ingredients the player was using. I didn't want to bother

with comparison tables to figure out whether the right ingredients had been chosen, either. And I didn't want to turn what was meant to be a simple children's program into a major adventure game. Basically, I decided to give the player two choices: quit while you're ahead and take what you've got *or* keep going and risk getting "zonked." (After all, it worked for "Let's Make a Deal!")

This made the player input easy to handle, though there were still a couple of options. Yes, I know that a simple "Yes/No" question seems like a pretty black and white programming situation. But it's not. Part of "user friendly" programming is using defaults and making the default answer as easy as possible to enter. Here's a short routine to accept keyboard input and analyze it.

```
10 INPUT"(Y)es or (N)o";X$
20 IF X$="Y" THEN GOTO 40
30 END
40 PRINT"You have chosen to continue."
```

At first glance, this little routine appears to check for a "Y" and continue if a "Y" is entered. And some programmers would be satisfied with that. But it also means that a typographical error will end the program. In fact, typing "Yes" would also end the program. Any input other than the single character "Y" will end the program. That's not very nice.

A better way to do it would be:

```
10 INPUT"(Y)es or (N)o";X$
20 IF X$="Y" THEN GOTO 60
30 IF X$="N" THEN GOTO 100
40 PRINT"PLEASE TYPE EITHER Y OR N.":GOT
0 10
60 PRINT"YOU HAVE CHOSEN TO CONTINUE."
100 END
```

This routine analyzes for a Y or an N and reacts accordingly, but it also automatically gives another chance to reenter your response after prompting for the correct format. The subroutine at 10010 does this in yet another way.

Since I expect that most players will want to continue playing, the only way to end the game is to answer "Y" to the question "Do you want to start cleaning up?" Any other response will continue the game. This actually makes it easier to continue the game, since all that need be entered is a RETURN.

The routine at 10100 uses a GET statement in place of an INPUT command. Since the INPUT statement always places a "?" on the screen, some programmers prefer to use the GET. GET, however, retrieves only one character at a time. So it is more difficult to use in some applications. For a routine where you only want one key anyway, it's ideal.

To use it, though, requires a small extra step. The GET command takes one byte (from the keyboard buffer), representing whatever key is being pressed at the exact moment that line of the program comes up. The player would have to be awfully fast to hit the key before the GET routine scans the keyboard. What you have to do is keep checking the keyboard until a key is pressed. To do this, you have the program compare the input to nothing and repeat the same line of the program if there's no input:

```
10 GET Q$
20 IF Q$="" THEN GOTO 10
```

or to do it in one line:

```
10 GET Q$: IF Q$="" THEN GOTO 10
```

That's basically how the routine at 10100 works, except that it became a little more complicated. I originally added the 10100 subroutine to facilitate paging in the instructions for playing the game. Since the instructions are a little long, they would scroll off the top of the screen. By using a GOSUB to 10100, the screen display stops and the reader is prompted to "PRESS A KEY TO CONTINUE." This is the way I originally wrote the routine:

```
10100 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
10200 GET Q$
10300 IF Q$="" THEN 10200
10400 IF Q$<>"" THEN RETURN
```

Later, as the program was developing, I found other instances when this routine would be beneficial. At those times, though, I wanted the program to prompt "PRESS A KEY TO TRY SOMETHING ELSE." Rather than add four more lines by duplicating the routine and calling it with a different GOSUB routine, I changed the routine to:

```
10100 IF I=1 THEN GOTO 10110
10105 PRINT"PRESS A KEY TO TRY SOMETHING
 ELSE"
10110 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
10200 GET Q$
10300 IF Q$="" THEN 10200
10400 IF Q$<>""THEN PRINT"[CLR]"
10500 RETURN
```

I then added a command at the beginning of the instructions that set I to 1. After the instructions, I is set back to 0. This causes the "PRESS A KEY TO CONTINUE" prompt to display only during the instructions.

CREATING THE FRAMEWORK

The program starts out with the routine to give the instructions. From there, we need to dimension our variables and reset them (just in case this is not the first pass through the game). Since the program offers the option to play again, we have to set the variables back to zero before the start of any additional games. It won't hurt to reset the variables for the first game either.

Before I could actually design the various subroutines, I had to decide what I wanted to happen to the player. Obviously one subroutine had to be reserved for being successful. One routine needed to handle the early return of the alchemist. But a program that only gives two results is pretty boring. There could be many ways for the player to fail, however, so using 3 x 5" note cards, I sat down and mapped out what I wanted to happen to the player in each subroutine.

First I thought of the MONSTER SUBROUTINE, and then I thought of adding the COUNTERSPELL SUBROUTINE to go with it.

I decided that having the player turn himself into various animals might be fun. And using the text, I indicated that the counterspell couldn't be used, since animals can't talk.

Then I thought of putting in the WASTE TIME SUBROUTINE. Originally these each had separate cards, but since the process is parallel they all ended up in the same section of the program.

Then I thought "Gee, what difference does it make if you waste time unless a clock is running?" So the CLOCK SUBROUTINE was written on a card. I didn't want to make the alchemist's return limit the number of turns in

ALCHEMIST'S APPRENTICE—FRAMEWORK

```
•900 PRINT "[CLEAR]
•910 PRINT "[10" "]ALCHEMIST'S APPRENTICE
 "
•920 PRINT "[17" "]COPYRIGHT"
•930 PRINT "[12" "]CHERYL COX PETERSON"
•940 PRINT "[19" "]1986"
•950 PRINT:PRINT:PRINT:PRINT
•960 INPUT"DO YOU NEED INSTRUCTIONS";X$
•970 IF X$="N" THEN GOTO 1500
•980 PRINT"[CLEAR]"
•1500 REM SETUP
•1550 PRINT"[CLEAR]"
•1560 DIM A(17), M1(17), M2(9), WT(9), R(
 11), RC(10)
•1570 I=0:CS=0:SB=0:Y=0:TL=0:G=0
•2000 REM MAIN ROUTINE
•2005 T=INT(RND(1)*3+1)
•2006 IF T=2 THEN TL=1
•2010 R=INT(RND(1)*10+1)
•2015 IF TL>0 THEN TL=TL+1
•2050 ON R GOSUB 4000,4500,5000,6000,7000
 ,7000,8000,8000,9000,9000,20500
•3000 REM CLOCK ROUTINE
•3001 PRINT"CLOCK"
•3002 PRINT TL:PRINT T
•3005 IF T<>1 THEN GOTO 2000
•3010 IF TL=120 THEN GOTO 3500
•3020 IF TL<>90 THEN 3030
•3025 GOTO 20000
•3030 GOTO 20000
•3500 REM GAME OVER
•3501 PRINT"GAME OVER"
•4000 REM FOUND IT SUBROUTINE
•4001 PRINT"FOUND"
•4499 RETURN
•4500 REM PARTLY SUCCESSFUL SUBROUTINE
•4501 PRINT"PARTLY"
•4999 RETURN
•5000 REM EARLY SUBROUTINE
•5001 PRINT"EARLY"
•6000 REM COUNTERSPELL ROUTINE
•6001 PRINT"COUNTER"
•6999 RETURN
•7000 REM WASTED TIME SUBROUTINE
•7001 PRINT"WASTE"
•7999 RETURN
•8000 REM MONSTER SUBROUTINE
•8001 PRINT"MONSTER"
•8999 RETURN
•9000 REM ANIMAL SUBROUTINE
•9001 PRINT"ANIMAL"
•9998 RETURN
•9999 END
•10010 PRINT"DO YOU WANT TO START CLEANIN
 G UP?"
•10020 PRINT"THE ALCHEMIST COULD RETURN E
 ARLY."
•10050 IF X$<>"Y"THEN 10090
```

a game to 60. (After all, this is a *very* random game.) Also, the game's plot provides for the alchemist to call, maybe. Of course, I then realized that once the alchemist calls, the clock has to be incremented each turn. So although originally conceived as a subroutine, the clock (out of necessity) became part of the main program.

I then organized the cards, putting subroutine line numbers at the top of each. I tried to figure out what commands were needed by each subroutine and planned out the variables needed for each card. Then I set out to put it all together.

To illustrate the organization process, the preliminary draft of the program is shown here. This is the program without all the subroutines filled in. (The listing for the complete, working game is on page 107.) By looking at the bare bones structure you'll get a better idea of how it all fits together. I also used this to test how well my random numbers were functioning. By running the program, you get a screen printout of the name of each routine as it is accessed. Once positive that everything was working at that point, entering the other subroutines was a fairly simple matter. A good point in favor of working this way is that when something does go wrong, you can be sure it isn't in the main routine. This makes it much easier to track down the inevitable "bugs" that creep in when you back is turned.

The main program uses a randomly generated number

(See page 107 for type-in listing)

```
·10060 PRINT"CONGRATULATIONS, YOU'VE GOT
";G;" GOLD PIECES."
·10070 PRINT"WOULD YOU LIKE TO TRY AGAIN?
"
·10080 INPUT"[025] OR [014]";D$
·10085 IF D$="Y"THEN 1500
·10089 END
·10090 PRINT"OK, LET'S TRY SOMETHING ELSE
":RETURN
·10100 PRINT:PRINT"PRESS A KEY TO CONTINU
E"
·10200 GET Q$
·10300 IF Q$="" THEN 10200
·10400 IF Q$<>"" THEN RETURN
·20000 REM ALCHEMIST RETURNS
·20001 PRINT"HE'S BACK"
·20010 PRINT"TOO BAD. THE ALCHEMIST IS BA
CK"
·20020 GOTO 20520
·20500 REM ALCHEMIST RETURNS EARLY
·20501 PRINT"HE'S EARLY"
·20510 PRINT"TOO BAD. THE ALCHEMIST RETUR
NED EARLY"
·20520 PRINT"AND YOU LOSE ALL YOUR GOLD."
·20530 PRINT"BETTER LUCK NEXT TIME."
·20540 INPUT"CARE TO TRY AGAIN";D$
·20550 IF D$="Y" THEN GOTO 1570
·20560 IF D$="N" THEN 9999
·20570 GOTO 20540
```

to route the program to one of the subroutines. Line 2005 gives a random number between 1 and 11. The ON-GOSUB in line 2050 uses the randomly generated number R to pick the appropriate subroutine from the list. If R=1 then it goes to 4000, If R=2 then it goes to 4500, etc.

Line 2010 also gives a random number between 1 and 11. This variable is used to determine whether or not the clock starts running. This means that there is a one in eleven chance that the one-hour clock will start running.

Line 3005 checks to see if random number T has come up 1. If T is equal to 1, the program continues execution at the next line. If not, it returns to line 2000 and does the main routine again. When it continues past line 3005, the program increments the variable TL (for time left). The next line tests TL to see if it is equal to 60. If TL is equal to 60 the game is over and the program shunts off to the end game routine. The next six lines are just timekeepers to tell the player how much longer he has left.

Of course, the random function in line 3010 could still send the program off to the EARLY SUBROUTINE at 5000. So, the clock running is no guarantee that the alchemist won't return early. (Aren't I devious?)

That's the main program. It just keeps looping through until the player is unlucky enough to stumble into one of the subroutines that ends the game. I'm not going to explain all the subroutines. You'll get more out of them if you analyze them yourselves. If you're really stumped drop me a note care of *Ahoy!* and I'll fill in the details. I will say that most of the subroutines use another randomly generated number to decide what happens within them. And some also use the ON-GOSUB command again to give a variety of responses. This is used in the ANIMAL SUBROUTINE in an interesting way.

One nice thing that this program illustrates is how creative you can get with a minimum of commands available. If you look at this program, you will find there are *no* advanced commands used. I stuck with the very basics in designing this program. No complicated math schemes; no complicated variable arrays; no disk read schemes. Nothing but simple input and output commands and some very simple comparisons. In fact, the only math used in the program is the incrementing of the variable TL in line 2015, the simple multiplication and addition in the randomizing lines, the addition of the time wasted to TL, and the addition used for keeping track of the player's gold count.

FURTHER READING

There are a number of good books available on BASIC programming and I'd like to recommend a few. I'm including a short list with this column.

One, *The Adventure Gamewriter's Handbook for Commodore* (Abacus Software), is designed much like this column. But it goes into a lot more detail. (Magazine columns afford limited space.) The book includes several programs, both games you can key in and utilities to help you create your own adventure games. It takes you through the creation of each routine used by the pro-

grams and explains how each works. A very good book for learning programming, since you have tangible results when you have finished it.

The C-64 Starter Book uses an easy-to-read textbook format to teach programming. It covers BASIC using good samples for illustration. It emphasizes flow charting and structuring, rather than slapdash layout.

C-64 Color Graphics: A Beginner's Guide teaches how to use high resolution graphics. Using good instructions and samples, it presents a complicated subject in a manner that will be useful to beginning programmers.

C-64 Subroutine Cookbook has over 60 useful BASIC subroutines. Though most of them are written for intermediate level programmers, some of the routines would be useful for beginners. Of course, if you keep following this column, you'll soon be up to intermediate level BASIC programming.

Another intermediate level book is *At Home with BASIC: Programming the C-64.* While this one has some heavy duty math routines that may not interest beginners, it also contains a good section on debugging procedures.

As mentioned in past columns, if you'd like to reach me in the quickest way possible, Viewtron is it. I am online live in the CB section on Saturday nights from 9 to 11 EST. Messages left on the For Starters bulletin board will probably be answered immediately, especially if you mention that you're an *Ahoy!* reader. My user ID number is 266399CCP. My handle in CB is Cherp!

By the way, the editor of *Ahoy!* turned down my idea for a column devoted to using Viewtron. He thinks that there aren't enough beginning Commodore users who have modems to justify devoting that much space to telecommunications. Anyone want to organize a letter writing campaign to convince *Ahoy!* that telecommunications deserves all the space it can get? Of course, those of you who don't want to hear about modems and stuff should write and support the editor's decision.

SEE PROGRAM LISTING ON PAGE 107

BOOKS FOR FURTHER READING

Adventure Gamewriter's Handbook
J. Walkowiak
Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
(616) 241-5510

At Home with BASIC: Programming the C-64
Henry Mullish and Doug Krugger
Simon and Schuster Books
1230 Avenue of the Americas
New York, NY 10020

C-64 Subroutine Cookbook
David D. Busch
Robert J. Brady Co.
Bowie, MD 20715

C-64 Color Graphics: A Beginner's Guide
Shaffer and Shaffer Applied Research and Development
Reston Publishing Co.
11480 Sunset Hills Road
Reston, VA 22090

The C-64 Starter Book
Christopher Titus, David Larsen and Jonathan Titus
Howard Sams and Co.
4300 West 62nd St.
Indianapolis, IN 46268

COMMODORE ROOTS

THE MUSICAL COMMODORE

How to Make SID Sing

By Mark Andrews

This month's column features both words and music. A type-and-run program on page 100 contains some pretty fancy graphics – including an alternate character set, a giant-sized screen message, and an animated sprite routine. A detailed explanation of how that program works was presented in last month's column, so I won't repeat it now. Instead, in the text that follows, we'll start exploring a brand-new topic: Commodore graphics and sound.

Despite its modest appearance and rock-bottom price, the C-64 has sound-and music-generating capabilities that rival those of synthesizers used by professional musicians. In this column, we'll look at some techniques that you can use to turn your Commodore's typewriter keyboard into a keyboard for reproducing an almost limitless variety of sounds.

You can use either BASIC or assembly language to program sound on your Commodore. But assembly language is much better than BASIC for writing music and sound routines. Here are some of the reasons:

• Sound is programmed on the Commodore 64 by manipulating specific bits in specific memory registers – a job that is slow and clumsy in BASIC, but fast and easy in assembly language.

• Timing is often critical in sound-and-music programming, so the speed of assembly language is especially important in programs that deal with music and sound.

• The length of a note cannot be determined very precisely in BASIC, but musical timing can be controlled with pinpoint precision in assembly language. In fact, by using a programming tool called an **interrupt**, you can make the lengths of musical notes, rests, and phrases completely independent of everything else in an assembly language program. By using interrupts, you can add music and sound to an assembly language program with perfect synchonization – and you can be certain that your soundtrack will always run at the same speed, no matter how many other features are then added to the program.

To understand how the Commodore 64/128 music synthesizer works, it helps to know a few fundamental principles of sound reproduction. I'll outline some of the principles now. Then we'll be ready to put your Commodore through its paces as a music synthesizer.

FOUR CHARACTERISTICS OF SOUND

When you hear a sound being played on a musical instrument, there are really four characteristics which are combined to create the sound that you perceive:

(1) **Volume**, or loudness.

(2) **Frequency**, or pitch.

(3) **Timbre**, or sound quality.

(4) **Dynamic range**, or the difference in level between the loudest sound that can be heard and the softest sound that can be heard during a given period of time. This period of time can range between the time it takes to play a single note and the length of a much longer listening experience, such as a musical performance or a complete musical recording.

The Commodore 64/128 contains a special microprocessor that can be programmed to control the volume, frequency, timbre, and dynamic range of sounds. It is this processor – called the 6581 SID (Sound Interface Device) – which gives the Commodore 64/128 its incredible sound-synthesizing capabilities.

THE THREE VOICES OF SID

The SID chip has three separate voices, and each of these can be independently programmed. This means that your Commodore can play music in three-part harmony, or you can use one voice for melody, one for percussion, and one for bass. You can use the SID chip to generate noises instead of music, and program each of SID's three voices to produce a different sound. SID can even be taught to synthesize sounds that are recognizable as speech – but that takes some pretty fancy programming.

In a moment, we'll look at how the SID chip can be used to program three voices: that is, how it can control the **volume**, **frequency**, and **timbre** of three independent sources of sound. But first let's see where the SID chip is situated in your computer's memory, and how it is designed to be programmed.

HOW TO FIND SID

In the C-64, Memory Registers $D400 through $D7FF (54272 to 55295 in decimal notation) are used to address the SID chip. These 1024 memory registers can be divided as shown in the chart on page 86.

Registers $D400 through $D418 are the only SID registers ordinarily used in BASIC to intermediate level SID programming. The largest block of memory in the table – the section that extends from $D400 through $D414 – can be broken down further into three subsections: one for Voice 1, one for Voice 2, and one for Voice 3. Let's take

a look now at how the SID chip's registers are used to program the volume, frequency, timbre, and dynamic range of the three voices of the C-64.

CONTROLLING SID'S VOLUME

For some reason known only to the Commodore 64's designers, it is not possible to control the **volume** of the SID chip's three voices individually; instead, the loudness of the overall sound produced by the SID register is determined by the value that is placed in the lower four bits (bits 0 through 3) of Memory Register $D418 (sometimes known as the SIGVOL register).

To control the volume of all sounds produced by the SID chip, all you have to do is place a number ranging from $0 to $F in the lower nybble of the SIGVOL register. The larger the value of this nybble is, the louder is the sound which the SID chip produces. If the value of the nybble is $0, no sound will be generated. In most applications, the volume nybble of the SIGVOL register is kept at $F, its maximum setting.

Bits 4 through 6 of the SIGVOL register are used to control three sound filters that are built into the SID chip: a low-pass filter, a bandpass filter, and a high-pass filter. The uses of these filters will be explained later in this column.

Bit 7 of the SIGVOL register can be used to disconnect the output of Voice 3 of the SID chip. Voice 3 is disconnected by setting this bit to 1. When Voice 3 is disconnected, an oscillator with which Voice 3 is equipped can be used for modulating the sound of the other two voices. Or the Voice 3 oscillator can be used for other purposes–such as generating random numbers–without affecting the output of sound.

When the filters controlled by Register $D418 are not being used, and when there is no need to disconnect Voice 3, the SID chip's volume can be controlled by simply storing a value form $0 to $F (or from 0 to 15 in decimal notation) in the SIGVOL register. But when Bits 5 through 7 of the SIGVOL register are in use, masking operations must be used in order to implement a desired volume setting without affecting the register's other functions. Here is a routine that could be used to implement a volume setting of 15 ($F in hexadecimal notation) without disturbing the high-order nybble of the SIGVOL register:

MEMORY BLOCKS USED BY SID

$D400 through $D406	– Registers for Voice 1
$D407 through $D40D	– Registers for Voice 2
$D40E through $D414	– Registers for Voice 3
$D415 through $D418	– Sound filter and volume controls
$D419 through $D41A	– Game paddle registers (not used for sound)
$D41B through $D41C	– Read-only sound registers (used in advanced synthesis operations)
$D41D through $D41F	– Not connected
$D420 through $D7FF	– Images of other registers; not used

SID'S SOUND REGISTERS

Address	Label	Function
$D400	FRELO1	Voice 1 Frequency Control (low byte)
$D401	FREHI1	Voice 1 Frequency Control (high byte)
$D402	PWLO1	Voice 1 Pulse Waveform Width (low byte)
$D403	PWHI1	Voice 1 Pulse Waveform Width (high nybble)
$D404	VCREG1	Voice 1 Control Register
$D405	ATDCY1	Voice 1 Attack/Decay Register
$D406	SUREL1	Voice 1 Sustain/Release Control Register
$D407	FRELO2	Voice 2 Frequency Control (low byte)
$D408	FREHI2	Voice 2 Frequency Control (high byte)
$D409	PWLO2	Voice 2 Pulse Waveform Width (low byte)
$D40A	PWHI2	Voice 2 Pulse Waveform Width (high nybble)
$D40B	VCREG2	Voice 2 Control Register
$D40C	ATDCY2	Voice 2 Attack/Decay Register
$D40D	SUREL2	Voice 2 Sustain/Release Control Register
$D40E	FRELO3	Voice 3 Frequency Control (low byte)
$D40F	FREHI3	Voice 3 Frequency Control (high byte)
$D410	PWLO3	Voice 3 Pulse Waveform Width (low byte)
$D411	PWHI3	Voice 3 Pulse Waveform Width (high nybble)
$D412	VCREG3	Voice 3 Control Register
$D413	ATDCY3	Voice 3 Attack/Decay Register
$D414	SUREL3	Voice 3 Sustain/Release Control Register
$D415	CUTLO	Filter Cutoff Frequency (low nybble)
$D416	CUTHI	Filter Cutoff Frequency (high byte)
$D417	RESON	Filter Resonance Control Register
$D418	SIGVOL	Volume and Filter Select Register

```
LDA SIGVOL
AND #$F0
ORA #$0F
STA SIGVOL
```

CONTROLLING FREQUENCY

The pitch of a musical note is determined by its **frequency**, usually measured in Hertz, or cycles per second. The frequencies that can be produced by the 64's SID chip range from 0 Hz (very low) to 4000 Hz (quite high).

The SID chip synthesizes the frequencies of sounds by carrying out a rather complex mathematical operation. First, it reads a pair of 8-bit values (one "low" value and one "high" value) that have been placed in a specific pair of **frequency control registers** (the SID chip has six such registers—two for each voice—and the addresses of all of them are listed in the table on the facing page).

When a pair of frequency-control registers has been loaded with two 8-bit values, it combines them into a 16-bit value. It then divides that 16-bit value by a number that is derived from a certain frequency: specifically, the frequency of a **system clock** built into the Commodore 64. Finally, when all of these operations have been carried out, the SID chip is able to generate a note of the desired frequency

Fortunately, you don't have to worry about all those technicalities to produce a note of a given frequency on the Commodore 64. All you have to do is place the proper values in the proper memory registers, and then set a certain bit in another register. All the values you need to play eight octaves of notes on the C-64 are listed on pages 384-386 of the *Programmer's Reference Guide*. In that table, you find two values (as "low" value and a "high' value) that must be placed in the SID chip's frequency control registers in order to produce each note that the 64 is capable of generating. But remember that the values listed in this table are not actual frequencies; they are numbers that the SID chip uses to *calculate* frequencies that are to be generated.

CONTROLLING TIMBRE

Timbre, or note quality, can be illustrated with the help of a structure called a **waveform**. The SID chip can generate four kinds of waves: a **triangle wave**, a **pulse wave**, a **sawtooth wave**, and a **noise wave**.

To understand the concept of waveforms, it is necessary to have a fundamental understanding of musical harmonics. So here goes:

With the help of an electronic instrument, it is possible to generate a tone that has just one pure frequency. But when a note is played on a musical instrument, more than one frequency is usually produced. In addition to a primary frequency, or a **fundamental**, there is usually a set of secondary frequencies called **harmonics**. It is this total **harmonic structure** which determines the timbre of a sound.

When a tone containing only a fundamental frequency is viewed on an oscilloscope, the pattern produced on

the screen is that of a pure **sine wave**. The waveform a flute produces is very close to this (see figure 1).

When harmonics are added to a tone, the result is a richer sound that produces what is known as a **triangle wave**(see figure 2). Triangle waveforms, or waves that are close to triangle waveforms, are produced by such instruments as xylophones, organs, and accordions.

When still more harmonics are added to a note, other kinds of waves are formed. Harpsichords, and trumpets, for example, produce what is called a **sawtooth wave**(see figure 3). And a piano generates a squarish type called a **square wave** or a **pulse wave** (see figure 4).

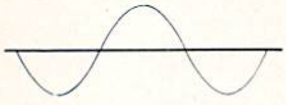


Figure 1: Sine Waveform

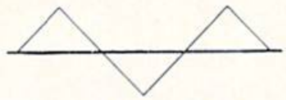


Figure 2: Triangle Waveform

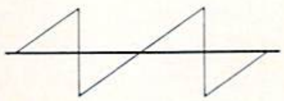


Figure 3: Sawtooth Waveform

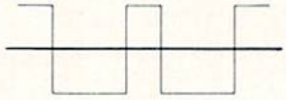


Figure 4: Pulse Waveform

PULSE WAVEFORM WIDTH CONTROLS

When the SID chip is called on to generate a pulse wave, it is necessary to use a **pulse waveform width control**. As Figure 1 illustrates, the pulses in a pulse waveform have a certain width, and are separated by gaps that may have a different width. The SID chip has six registers—two for each voice—that can be used to control the widths of pulse waveforms. A pulse wave generated by the SID chip has a 12-bit resolution, so only 12 bits in each pair of width-control registers are used: all eight bytes of each low-order register, plus the lower nybble of each high-order register.

The setting of each width-control register determines how long a pulse wave will stay at the high part of its cycle. The possible range of 12-bit values, from 0 to 4095, makes it possible for a square wave to stay in the high part of its cycle from 0% to 100% of the time, in 4096 steps.
duce some—in next month's column. ☐

NOISE WAVEFORMS

Another kind of waveform that the SID chip can produce is a **noise waveform**. A noise waveform creates a random sound output that varies with a frequency proportionate to that of an oscillator built into Voice 1. Noise waveforms are often used to imitate the sound of explosions, drums, and other nonmusical noises.

We'll take a look at how the Commodore 64 reproduces all these types of waveforms—and then we'll make it produce some—in next month's column. ☐

SEE PROGRAM LISTING ON PAGE 100

COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting, and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible, where appropriate. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #29-1: PRINT MAKER

This problem was suggested by Allan Flippin (San Jose, CA). When this program is run, the user specifies a line number, and then the screen clears with the cursor in the upper left corner. All keystrokes typed by the user are displayed on the screen just as they would be if they were entered in direct mode. All keystrokes are stored until the RETURN key is pressed. At that time, the program creates a PRINT statement with the given line number which, when executed, will generate the same sequence of keystrokes and screen display. All keystrokes are allowed, including Insert/Delete, cursor movement, text, and graphics.

For example, assume the user enters 5 for the line number, then types the word "COMMODARE", pressing the <cursor down> key after each letter is typed. The text is shown going diagonally downward on the screen. Once the RETURN key is pressed, this statement is displayed:

```
5 PRINT "CQOQMQMQOQDQOQRQEQ"
```

where *Q* is the normal screen symbol for the <cursor down> key.

PROBLEM #29-2: GENERIC GAME

Claude Landusky (Waianae, HI) suggested programming the old standard "guess the digits" game. The computer picks a four-digit number, with no two digits alike. The user guesses the number. The computer responds with the number of correct digits in the guess and the number of correct digits in the correct position. The user attempts to deduce the computer's number in the fewest guesses.

For example, assume the computer picks "1234" and the user guesses "2534". The computer returns the score "3,2" since three of the guessed digits are correct, and two of them are in the proper positions. Make this a "no frills" program.

PROBLEM #29-3: BEAT KEEPER

Barry King (Nome, AK) suggested creating a musician's metronome with an audible tick, a character moving back and forth on the screen, and a speed displayed in beats per minute which is adjustable during operation. As usual, simplest is best.

PROBLEM #29-4: LARGE PRODUCT

This one should not be very difficult. Using the digits 1 through 9 only once, create two numbers which give the greatest product when multiplied together. For example, 12345 x 6789 is one choice, but obviously 54321 x 9876 is even better. Can you find the best?

This month we will look at readers' solutions to *Commodares* from the January 1986 issue of *Ahoy!* As promised, my solution to *Problem #24-1: Printing Permutations* is listed below.

```
10 REM PROBLEM #24-1 :
15 REM      PRINTING PERMUTATIONS
20 N=5 :REM # TO BE PERMUTATED
30 K=0 : NW=-1 : L=1
40 GOSUB 100
50 END
100 NW=NW+1 : VL(K)=NW
110 IF NW=N THEN GOSUB 500
120 FOR T=1 TO N
130 IF VL(T)<>0 THEN 160
140 T(L)=T : K(L)=K : K=T : L=L+1
150 GOSUB 100 : L=L-1 : T=T(L) : K=K(L)
160 NEXT T
170 NW=NW-1 : VL(K)=0
180 RETURN
500 KK=KK+1 : PRINT KK,
510 FOR I=1 TO N : PRINT VL(I); : NEXT
520 PRINT
530 RETURN
```

This is a BASIC implementation of the following algorithm discussed last month for printing all permutations of a given set of numbers.

```
procedure visit(k)
  begin
  now=now+1 : val(k)=now
  if now=n then print all values of val(k)
for t=1 to n
  if val(t)=0 then call visit(t)
next t
now=now-1 : val(k)=0
end.
```

The routine is initially called with k=0, now=−1, n is the number of items to be permutated, and all elements of val( ) are 0 (i.e. k=0 : now=−1 : n=3 : gosub visit). It is true that BASIC does not handle recursion very well, but this program is one more example that nothing is impossible in BASIC (except time-dependent applications, perhaps).

The only tricky part of this program is in lines 140 and 150. The algorithm says to recursively call the subroutine at line 100 with the argument K equal to the current value of T if VL(T) equals 0. Otherwise repeat the FOR/NEXT loop with the next value of T. The subscript L in line 140 keeps track of the "level" or depth of recursion of the subroutine as well as the current values of K and T at that level.

Once all values of T from 1 to N have been used at the lowest level of the subroutine, lines 170 and 180 will finally be executed. The program returns to the statements after the GOSUB 100 in line 150. Eventually all levels are completed, and the RETURN brings the program back to line 50 where it ends.

The program is very slow compared to the solutions presented last month. It may interest you to know that the C-128 in the FAST mode executes this program roughly 20 percent faster than the IBM PC does. Alan Flippin's solution last month is still six times faster than this program. Those of you who are ready for a real challenge might enjoy "playing computer" to figure out how this program works.

Although not exactly *Commodare* material, these problems from Robert E. Smith (Van Alstyne, TX) might intrigue you. Robert asks if it is possible to use the C-64 as a videotape attachment for editing, fade-out, fade-in, and other effects. He also suggested putting a sprite on the screen over the VCR image (just as in some of the newer video arcade games). If you have any experience or information about the feasibility of such tasks, let us know.

There was quite a bit of interest in *Problem #25-2: Character Spiral* submitted by Necah Buyukdura (Ankara, Turkey). The problem requested the fastest BASIC solution for winding a character spiral outward in the counter clockwise direction, and then unwinding it clockwise in a 25 by 25 character figure. Three solutions are listed below.

The following program from Clifford Dedmore (North Bend, OR) can be compressed by merging lines 30 and 40 as well as merging lines 50 and 60 if abbreviations are used. Clifford's program runs in roughly 246 jiffies on the C-64. It takes over 400 jiffies on the C-128 in 40-column mode, and less than 200 jiffies on the C-128 in FAST 80-column mode.

```
·1 REM
·2 REM PROBLEM #25-1 :
·3 REM   CHARACTER SPIRAL
·4 REM SOLUTION BY
·5 REM   CLIFFORD DEDMORE
·6 REM
·10 T=1:V=25:PRINT"[CLEAR][13"[DOWN]"]"TA
 B(12)".";
·20 J=J+T:FORK=TTOJ+(J=V):PRINT".";:NEXT:
 IFJ=VTHEN50
·30 FORK=TTOJ:PRINT"[LEFT][UP].";:NEXT:J=
 J+T:FORK=TTOJ:PRINT"[LEFT][LEFT].";:NEXT
·40 FORK=TTOJ:PRINT"[LEFT][DOWN].";:NEXT:
 GOTO20
·50 FORK=JTOT+(J<>V)STEP-T:PRINT"[LEFT] [
 LEFT]";:NEXT:IFJ=T THEN RUN
·60 FORK=JTOT+TSTEP-T:PRINT"[UP] [LEFT]";
 :NEXT:J=J-T:FORK=JTO.STEP-T:PRINT" ";:NE
 XT
·70 FORK=JTOT+TSTEP-T:PRINT"[DOWN][LEFT]
 ";
·80 NEXT:J=J-T:GOTO50
```

Clifford mentioned some of the characteristics of his program which increase its speed. He used a decimal point in line 60 instead of a zero. Using a FOR-NEXT loop which counts down to zero is faster than one which counts up. Using variables rather than constants also speeds up the program. Clifford put the REM statements with his name, address, and problem number at the end of his program originally, which further reduces execution time.

The program from Barry King (Nome, AK) is also very fast. Barry's program adds some variety to the characters displayed, producing quite a hypnotic presentation. Lines 50 and 55 as well as lines 90 and 95 may be merged into single lines if abbreviations are used.

```
·1 REM
·2 REM PROBLEM #25-1 :
·3 REM   CHARACTER SPIRAL
·4 REM SOLUTION BY
·5 REM   BARRY KING
·6 REM
·10 PRINT"[CLEAR]"
·20 FORX=49TO127STEP2:R$=CHR$(X):U$=R$+"[
 UP][LEFT]":L$=R$+"[LEFT][LEFT]":D$=R$+"[
 DOWN][LEFT]"
·30 PRINT"[HOME]":FORA=1TO11:PRINT"[DOWN]
 [RIGHT]";:NEXT:PRINTR$;U$;
```

```
40 FORA=0TO22STEP2
50 FORB=0TOA:PRINTL$;:NEXT:FORB=0TOA+1:P
RINTD$;:NEXT
55 FORB=0TOA+1:PRINTR$;:NEXT:FORB=0TOA+2
:PRINTU$;:NEXT:NEXT
70 R$=CHR$(X+1):U$=R$+"[UP][LEFT]":L$=R$
+"[LEFT][LEFT]":D$=R$+"[DOWN][LEFT]"
80 FORA=22TO0STEP-2
90 FORB=0TOA+2:PRINTD$;:NEXT:FORB=0TOA+1
:PRINTL$;:NEXT
95 FORB=0TOA+1:PRINTU$;:NEXT:FORB=0TOA:P
RINTR$;:NEXT
100 NEXT:NEXT:GOTO20
```

The third solution is from Matt Shapiro (Fort Lee, NJ). Matt's program spends a few moments at first initializing some data strings. The result of the preliminary preparation is a lightning fast display. Be careful to include the two null strings in line 40.

```
1 REM
2 REM PROBLEM #25-1 :
3 REM   CHARACTER SPIRAL
4 REM SOLUTION BY
5 REM   MATT SHAPIRO
6 REM
10 C$(0)="[s Q]":C$(1)=" "
20 FORJ=0TO1:FORK=0TO3:READD$:D$=C$(J)+D
$:FORL=1TO5:D$=D$+D$:NEXT
30 D$(J,K)=D$:NEXT:NEXT
40 DATA"[LEFT][UP]","[LEFT][LEFT]","[LEF
T][DOWN]","","[LEFT][LEFT]","[LEFT][UP]"
,"","[LEFT][DOWN]"
50 DIME$(1,3,12):FORJ=0TO1:FORK=0TO3:M=3
+2*(J+K=3)
60 FORL=1TO12:N=(2*L+(K=0)-(K=3))*(1-2*J
)+26*J
70 E$(J,K,L)=LEFT$(D$(J,K),M*N):NEXT:NEX
T:NEXT
80 E$(1,0,1)=LEFT$(E$(1,0,1),72):E$(0,3,
12)=E$(0,3,12)+"[LEFT]"
90 E$(1,3,12)=E$(1,3,12)+C$(1)+"[LEFT][L
EFT]"+C$(1)+"[LEFT]":E$(0,0,1)=C$(0)+E$(
0,0,1)
100 J=0:PRINT"[CLEAR][12"[RIGHT]"][12"[D
OWN]"]";
110 FORL=1TO12:FORK=0TO3:PRINTE$(J,K,L);
:NEXT:NEXT:J=1-J:GOTO110
```

Wallace Leeker (Lemay, MO) and Allan Flippin (San Jose, CA) found that the quickest solutions consisted of separate POKE or PRINT statements. Unfortunately that amounts to a lot of statements. Alan's solution requires only 69 jiffies (1.15 seconds). Wallace found a way to let the computer create its own POKE statements. He used ideas from Don French's solution to the *REM Remover Commodare* in the January 1986 issue of *Ahoy!* as well as *The Magical Link* in the *Rupert Report* of the same issue.

Richard Wilson (Toronto, ONT) used the C-64 SET CURSOR routine located at 58636 ($E50C) to position the cursor before each PRINT. It is used as follows:

```
POKE 781,ROW : POKE 782,COL : SYS 58636
: PRINT A$
```

where ROW is a value between 0 and 25, COL is from 0 to 40, and A$ is the string to be printed.

The corresponding memory location for the C-128 is 52332. You may access this routine on the C-128 with the following:

```
SYS 52332,,ROW,COL : PRINT A$
```

The adjacent commas indicate that nothing is to be loaded into the accumulator when the routine is called. The ROW and COL values are loaded into the X and Y registers when the SYS command is executed. The C-128 has a BASIC command built in, which makes the process easier and quicker still:

```
CHAR,COL,ROW : PRINT A$
```

Notice the reversed order of the ROW and COL.

Other readers who sent solutions to this problem include Alan Leish (Los Angeles, CA), Jim Speers (Niles, MI), Frank T. Smith (Wilmington, DE), Ron Weiner (Levittown, PA), Jeff Szarek (San Antonio, TX), Steven Steckler (Columbia, MD), Douglas Underwood (Walla

Walla, WA), Dennis Furman, Bill Okerblom (Providence, RI), and Billy Thompson (Richmond, VA).

Allan Flippin (San Jose, CA), Ron Weiner (Levittown, PA), Matt Shapiro (Fort Lee, NJ), Barry King (Nome, AK), Clifford Dedmore (North Bend, OR), and Mark Breault (Brandon, MAN) sent solutions to Jim Speers' *Problem #25-2: Dandy Deletion.* Mark Breault's program is listed below:

```
·1 REM
·2 REM PROBLEM #25-2 :
·3 REM   DANDY DELETION
·4 REM SOLUTION BY
·5 REM   MARK BREAULT
·6 REM
·60000 INPUT"BEGIN,END";B,E:A=2049:PRINT"
 [CLEAR][3"[DOWN]"][8" "]:E="E":GOTO60010
 "
·60010 N=PEEK(A+2)+256*PEEK(A+3):IFN<BTHE
 NA=PEEK(A)+256*PEEK(A+1):GOTO60010
·60020 IFN<=ETHENPRINT"[HOME][DOWN][DOWN]
 "N:PRINT"A="A"[HOME]";:POKE631,13:POKE63
 2,13:POKE198,2:END
```

This program is for the C-64. These lines must be added to the program in memory. Type RUN 60000 and specify the beginning and ending line numbers of the original program to be deleted. In the blink of an eye, unwanted lines will vanish by means of the "dynamic keyboard" routine in line 60020. C-128 users have it a bit easier. Simply type DELETE XXX-YYY to accomplish the same task.

Problem #25-3: Color Criteria, which was suggested by Steven Steckler (Columbia, MD), brought many solutions. A program such as this which requests color names for the screen border, background, and text colors should certainly provide prompts for the convenience of the user. The program submitted by Ron Weiner (Levittown, PA) is listed below.

```
1 REM
2 REM PROBLEM #25-3 :
3 REM   COLOR CRITERIA
4 REM SOLUTION FOR THE C-64 BY
5 REM   RON WEINER
6 REM
10 DIM CO$(15):FOR I=0TO15:READ CO$(I):N
EXT:FOR I=1TO3:READ LOC(I):NEXT
20 PRINT"ENTER BORDER,BACKGROUND,TEXT":F
OR I=0TO7:PRINTCO$(I),CO$(I+8):NEXT
30 INPUT"YOUR CHOICE";CH$(1),CH$(2),CH$(
3)
40 FOR I=1TO3:FOR J=0TO15:IF CH$(I)=CO$(
J) THEN POKE LOC(I),J
50 NEXT J,I:DATA BLACK,WHITE,RED,CYAN,PU
RPLE,GREEN,BLUE,YELLOW,ORANGE,BROWN
60 DATA LT.RED,GREY1,GREY2,LT.GREEN,LT.B
LUE,GREY3,53280,53281,646
```

The user must type the colors by name, properly spelled. It is nice that the program prints out the possiblek choices. Then again, as several readers mentioned, it would be nicer still if the program provided a menu to allow a simple numerical entry. How about adding some artificial intelligence so that the program would take a guess even if the user abbreviated or misspelled the colors?

The program from Kevin Nauss (Seattle, WA) is written for the C-128 in the 40-column mode. It allows the user to enter either the color name or the color number.

```
1 REM
2 REM PROBLEM #25-3 :
3 REM   COLOR CRITERIA
4 REM SOLUTION FOR C-128 (40 COLUMN) BY
5 REM   KEVIN NAUSS
6 REM
10 DIM C$(3),C(3),CN$(16):CLR:FOR I=1TO1
6:READCN$(I):PRINTI;CN$(I),:NEXT:FOR J=1
TO3:READ C(J):NEXT:PRINT:INPUT"BORDER,BA
CKGROUND,TEXT";C$(1),C$(2),C$(3)
20 FORJ=1TO3:I=1:OPEN OR I=16:IF C$(J)=C
N$(I) THEN LIST C(J),I:GET:GOTO IF LEN(C
$(J))<3 THEN IF VAL(C$(J))=I THEN LIST C
(J),I:GET
30 I=I+1:CLOSE:NEXT
40 DATA BLACK,WHITE,RED,CYAN,PURPLE,GREE
N,BLUE,YELLOW,ORANGE,BROWN,LIGHT RED,DAR
K GRAY,MEDIUM GRAY,LIGHT GREEN,LIGHT BLU
E,LIGHT GRAY,4,0,5
```

Thanks also to Keith Smith (Tonawanda, NY), Pat McConville (Manassas Park, VA), Len Lindsay (Madison, WI), Bill Okerblom (Providence, RI), Gary Hudach (Youngstown, OH), Marvin Segal (Springfield, NJ), Claude Landusky (Waianae, HI), and Arthur Furrow (Fort Kent, ME), as well as several readers already mentioned.

Finally, *Problem #25-4: Central Locator* produced a variety of solutions. This problem was to center the text on a line as it is typed. Several solutions met the requirement for a single line of text. Others went further, allowing a full screen of centered text, along with deletions, flashing cursor, and text color changes.

The COMAL solution from Len Lindsay (Madison, WI) is a compact program which centers the text on a single line.

```
1 REM
2 REM PROBLEM #25-4 :
3 REM   CENTRAL LOCATOR
4 REM COMAL SOLUTION BY
5 REM   LEN LINDSAY
6 REM
10 USE SYSTEM
20 TEXT$:=""
30 REPEAT
40   PRINT AT 0,(40-LEN(TEXT$)) DIV 2: T
EXT$,
```

```
50 TEXT$:+INKEY$
60 UNTIL TEXT$(LEN(TEXT$))=CHR$(13)
```

The PRINT AT statement is certainly a handy feature of the COMAL language.

The program listed below from Jim Speers (Niles, MI) allows a whole screen of text to be printed and centered, line by line.

```
·1 REM
·2 REM PROBLEM #25-4 :
·3 REM   CENTRAL LOCATOR
·4 REM SOLUTION BY
·5 REM   JIM SPEERS
·6 REM
·100 X%=20:Y=20:PRINT"[CLEAR]HIT RETURN,
 THEN ENTER TEXT":INPUTZ$:PRINT"[CLEAR]"
·110 PRINTTAB(X%)A$"[RVSON] [RVSOFF]";:PO
 KE198,0:WAIT198,1:GETZ$:A$=A$+Z$:Y=Y-.51
 :X%=Y+.5
·120 IFX%>1ANDASC(Z$)<>13ANDZ$<>"[BACKARR
 OW]"THENPRINT"[UP]":GOTO110
·130 IFZ$="[BACKARROW]"THENPRINTCHR$(20):
 END
·140 PRINTCHR$(20)Z$:X%=20:Y=20:A$="":PRI
 NT"[UP]":IFZ$=CHR$(13)THENPRINT"[UP]";
·150 GOTO110
```

Jim's program handles all characters except the cursor keys. Perhaps you can modify the program to use those as well. C-128 owners can replace the POKE, WAIT, and GET statements in line 110 with the GETKEY Z$ command. To exit, press the back-arrow key.

Congratulations to Matt Shapiro (Fort Lee, NJ), Ron Weiner (Levittown, PA), Allan Flippin (San Jose, CA), Paul Lalli (McAlester, OK)—thanks for the invitation to Oklahoma State Firefighters' Convention, James Dunavant (Gainesville, FL), Dennis Furman, Kevin Collins (Toledo, OH), Claude Landusky (Waianae, HI), and Barry King (Nome, AK) for your solutions to this problem.

We are looking forward to some clever and creative solutions as well as some intriguing and thought-provoking challenges from all of you next month. □

The program listings in *Commodares* and all the other programs in this issue of *Ahoy!* are available on disk or cassette. See page 73 for details.

THE GREAT ESCAPE

Continued from page 23

but finally you can put an end to that flashing. ESC F returns the default flash mode.

ESC T and ESC B let you create a window on the screen simply by positioning the cursor. Put the cursor at the top left corner of the desired rectangular window and press ESC T. Move the cursor to the bottom right corner of the window and press ESC B. All cursor movement, listings, and printings will appear within the window. Pressing the Shift-CLR key clears only the window. Pressing HOME moves the cursor to the top left corner of the window.

If you press ESC T followed by ESC B without moving the cursor, you create a one-character window. It looks like the cursor is stuck. You may press RUN-STOP and RESTORE to regain access to the whole screen. A less drastic procedure is simply to press the HOME key twice. That also eliminates the window.

On the 80-column display, you may change the cursor to an underline or back to a solid block with ESC U and ESC S. If you prefer dark text on a light background in 80-column mode, press ESC R. Return to a normal, non-reverse video display with ESC N.

ESC J and ESC K save wear and tear on the cursor keys and your fingers. Move quickly to the left or the right end of the current program with these escape sequences. They are not mnemonic, but J is to the left of K on the keyboard.

If the cursor is in the middle of a line, ESC P erases everything from the start of the line up to the cursor. To erase from the cursor to the end of the current line, press ESC Q. These sequences should give the DEL and SPACE keys a break.

Need room to work? ESC @ clears the screen from the cursor to the end of the screen (or current window).

ESC D deletes the entire line in which the cursor is located, and it closes up the gap. Note that ESC Q will delete an entire line if the cursor is at the beginning of it, but the lines below are not scrolled up to fill the gap.

To create a gap between two lines, press ESC I. The line containing the cursor and all lines below it are moved down, and the cursor is moved to the start of the blank line just created.

ESC V and ESC W move the text on the screen up and down while the cursor remains at a fixed location. These look like handy functions for a word processor.

Tabs may be defined on the screen with the CONTROL-X sequence. The CONTROL key is held down while the X key is pressed to set a tab at the cursor's location. The default tabs are at every eighth charaction position. Press ESC Z to clear all tabs. Press ESC Y to restore the default tabs. The TAB key moves the cursor to the next defined tab position, if there is one. Otherwise, it moves the cursor to the end of the current line.

The final escape sequences enable or disable the bell function. ESC G allows the CONTROL-G keystroke or PRINT CHR$(7) to ring the bell. ESC H silences the bell.

USING THEM

Now that we have described their functions, let's look at some of the ways to use the Escape sequences. A first application might be to fix up the default function key definitions. If the cursor is in the middle of a screen full of text when you decide to save your program, you might be tempted to press function key f5 (DSAVE"). Unfortunately you may either generate a syntax error or use the wrong filename.

What's the problem? The f5 key prints DSAVE" on the screen wherever the cursor is. If there is text on the line to the left of the cursor, the DSAVE command is preceded by irrelevant characters and is not interpreted properly. If there is text on the line after the DSAVE", additional characters will be appended to whatever filename you type.

The solution? Obviously you could move the cursor to an empty line before pressing f5. That is not always convenient, and it certainly isn't necessary. Simply modify the definition of the f5 key as follows:

```
KEY 5,CHR$(27)+"J"+CHR$(27)+"QDSAVE"+CHR
$(34)
```

You may recognize the CHR$(27) as the ASCII code for Escape. The two Escape sequences used in the f5 definition are ESC J and ESC Q. Now the first two functions performed by the f5 key are "Move the cursor to the start of the current line" and "Delete all characters to the end of the line." The remaining characters DSAVE and CHR$(34) are merely echoed to the screen. CHR$(34) represents the quotation mark. Consequently pressing the f5 key clears the line and prints DSAVE".

You might wonder why not use ESC D to delete the entire line regardless of the position of the cursor. The problem with ESC D is that any text below the deleted line is scrolled up to fill the gap, so the cursor still might not be on a blank line.

There is one simpler solution. That is to use ESC I to insert a blank line and move the cursor to the start of it. In that case, the definition for f5 is as follows:

```
KEY 5,CHR$(27)+"IDSAVE"+CHR$(34)
```

You might write a program which redefines all of the function keys to include the ESC I or the ESC J, ESC Q sequences. The first program that I run upon power up is listed on page 113. The variable EE$ is assigned the ESC I sequence. CR$ represents the carriage return. Most of the function key definitions are similar to the f5 description above. F1 and f4 are the only definitions that need any explanation.

F1 provides an enhancement which I sorely missed on the C-64, a genuine DELETE key. I consider the DEL key on the Commodore computers to be actually a "rub-out" key rather than a "delete" key. What's the difference, you might ask? The DEL key "rubs out" characters to the left of the cursor and moves the cursor to the left. The DELETE key deletes the character at the cursor and pulls all text to the right of the cursor towards the left, while the cursor sits stationary.

Both types of delete keys are useful. The DEL key is handy for erasures as text is being entered. I find the f1 "delete" key to be more convenient when modifying a program line after it has been entered. You must use the f1 "delete" key for a while to fully appreciate the difference.

The other function I really missed on the C-64 is the LLIST command. In most other versions of BASIC, LLIST sends a program listing to the printer. Commodore BASIC makes you work for your hardcopy.

Function key f4 is programmed in line 14 to create an LLIST command. My printer is given a file number 222. F4 CLOSEs then OPENs file number 222, issues CMD 222, then LISTs the program. When the listing is done, the remaining characters in the f4 definition are displayed ("PRINT#222:CLOSE222") and a final carriage return (CHR$(13)) is executed, clearing the printer channel and closing the file.

Certainly these functions could have been defined for the function keys of the C-64. The advantage of the C-128 implementation is that the keys are very easily changed without a special program, and the definitions are not lost after pressing RUN/STOP-RESTORE.

We have seen that the Escape sequences may be executed in direct mode by pressing and releasing the ESC key followed by the second command key. It is also possible to press and hold the CONTROL key and the "[" key simultaneously to simulate the ESC key. Both keys must be released before pressing the command key. That is just some trivia. There is probably no reason *not* to use the ESC key rather than CONTROL-[.

Just one more tidbit. If you accidentally press the ESC key, simply press it a second time to cancel the first press. Actually any second keystroke besides "" and "A" through "Z" nullifies the ESC keystroke.

The Escape sequences are immediately useful in direct mode while you are creating and editing programs. Don't overlook their usefulness in programs as well. The sample program discussed earlier shows how to access the Escape commands. By defining the function keys and utilizing the Escape sequences, it should be possible to create a very powerful word processor or program editor in BASIC.

Practice using the Escape sequences. Make a reference card listing them and keep it handy. Before long, you won't need the card. You will wonder how you managed before you had the power of the great Escape sequences at your fingertips. □

SEE PROGRAM LISTING ON PAGE 113

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listing guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!*'s program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; VIC 20 lines, a maximum of 88 characters, or 4 screen lines). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the VIC 20 and C-64. The version appropriate for your machine will help you proofread our programs after you type them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See the instructions preceding each program.)

Also on the following page you will find *Flankspeed*, our ML entry program, and instructions on its use. □

Call *Ahoy!* at 212-239-0855 with any problems.

When You See	It Means	You Type		You Will See
[CLEAR]	Screen Clear	SHIFT	CLR/HOME	
[HOME]	Home		CLR/HOME	
[UP]	Cursor Up	SHIFT	↑ CRSR ↓	
[DOWN]	Cursor Down		↑ CRSR ↓	
[LEFT]	Cursor Left	SHIFT	←CRSR→	
[RIGHT]	Cursor Right		←CRSR→	
[SS]	Shifted Space	SHIFT	Space	
[INSERT]	Insert	SHIFT	INST/DEL	
[DEL]	Delete		INST/DEL	
[RVSON]	Reverse On	CNTRL	9	
[RVSOFF]	Reverse Off	CNTRL	0	
[UPARROW]	Up Arrow		↑	
[BACKARROW]	Back Arrow		←	
[PI]	PI		π	
[EP]	English Pound		£	

When You See	It Means	You Type		You Will See
[BLACK]	Black	CNTRL	1	
[WHITE]	White	CNTRL	2	
[RED]	Red	CNTRL	3	
[CYAN]	Cyan	CNTRL	4	
[PURPLE]	Purple	CNTRL	5	
[GREEN]	Green	CNTRL	6	
[BLUE]	Blue	CNTRL	7	
[YELLOW]	Yellow	CNTRL	8	
[F1]	Function 1		F1	
[F2]	Function 2	SHIFT	F1	
[F3]	Function 3		F3	
[F4]	Function 4	SHIFT	F3	
[F5]	Function 5		F5	
[F6]	Function 6	SHIFT	F5	
[F7]	Function 7		F7	
[F8]	Function 8	SHIFT	F7	

BUG REPELLENT By MICHAEL KLEINERT and DAVID BARRON

Bug Repellent is a checksum program used for proofreading BASIC listings typed in from *Ahoy!* magazine. For each program line you enter, *Bug Repellent* will produce a two-letter code that should match the code listed beside that line in the magazine.

Type in, save, and run the *Bug Repellent.* (If you have a C-64, type in the C-64 version. If you have a C-128, you will need to type in the C-64 version for use with C-64 programs, and the C-128 version for use with C-128 programs.) If you have typed in *Bug Repellent* properly, you will get the message BUG REPELLENT INSTALLED; otherwise you will get an error message. If you get an error message, double check the *Bug Repellent* program for typing mistakes. Type NEW and hit RETURN. Then type in and save, or load, the *Ahoy!* program you wish to check. Type in SYS 49152 for the C-64 version or SYS 3072 for the C-128 version and hit RETURN (this will begin execution of *Bug Repellent*). You will see the prompt SCREEN OR PRINTER ? Hit S if you want the codes listed on the screen, or P if you want them listed on the printer. To pause the listing depress and hold the SHIFT key.

Compare the codes your machine generates to those listed to the right of the corresponding program lines. If you spot a difference, that line contains an error. Write down the numbers of the lines where the contradictions occur. LIST each line, locate the errors, and correct them.

COMMODORE 64 VERSION

```
·100 FOR X = 49152 TO 49488:READY:S=S+Y           AB
·110 IF Y<0 OR Y>255 THEN 130                     EA
·120 POKE X,Y:NEXT:GOTO140                        ID
·130 PRINT"[CLEAR][DOWN]**ERROR**":PRINT"[DOWN
 ]PLEASE CHECK LINE"PEEK(64)*256+PEEK(63):END    ID
·140 IF S<>44677 THEN PRINT"[CLEAR][DOWN]**ERR
 OR**":PRINT"[DOWN]PLEASE CHECK DATA LINES 170
 -500":END                                        HJ
·150 PRINT"[CLEAR]":POKE53280,0:POKE53281,6:PO
 KE646,1                                          NP
·160 PRINT"[RVSON][6" "]C-64 BUG REPELLENT INS
 TALLED[6" "]"                                    LF
·170 DATA32,161,192,165,43,133,251,165,44,133    DL
·180 DATA252,160,0,132,254,32,37,193,234,177     DB
·190 DATA251,208,3,76,138,192,230,251,208,2      OF
·200 DATA230,252,76,43,192,76,73,78,69,32        KN
·210 DATA35,32,0,169,35,160,192,32,30,171        CA
·220 DATA160,0,177,251,170,230,251,208,2,230     CE
·230 DATA252,177,251,32,205,189,169,58,32,210    JE
·240 DATA255,169,0,133,253,230,254,32,37,193     CL
·250 DATA234,165,253,160,0,76,13,193,133,253     NB
·260 DATA177,251,208,237,165,253,41,240,74,74    MB
·270 DATA74,74,24,105,65,32,210,255,165,253      EP
·280 DATA 41,15,24,105,65,32,210,255,169,13      GH
·290 DATA32,220,192,230,63,208,2,230,64,230      AN
·300 DATA251,208,2,230,252,76,11,192,169,153     NG
·310 DATA160,192,32,30,171,166,63,165,64,76      BF
·320 DATA231,192,96,76,73,78,69,83,58,32         EP
·330 DATA0,169,247,160,192,32,30,171,169,3       PJ
·340 DATA133,254,32,228,255,201,83,240,6,201     FK
·350 DATA80,208,245,230,254,32,210,255,169,4     FL
·360 DATA166,254,160,255,32,186,255,169,0,133    CL
·370 DATA63,133,64,133,2,32,189,255,32,192       GC
·380 DATA255,166,254,32,201,255,76,73,193,96     NN
·390 DATA32,210,255,173,141,2,41,1,208,249       NH
·400 DATA96,32,205,189,169,13,32,210,255,32      IM
·410 DATA204,255,169,4,76,195,255,147,83,67      KC
·420 DATA82,69,69,78,32,79,82,32,80,82           DC
·430 DATA 73,78,84,69,82,32,63,32,0,76           ML
·440 DATA44,193,234,177,251,201,32,240,6,138     GN
·450 DATA113,251,69,254,170,138,76,88,192,0      JK
·460 DATA0,0,0,230,251,208,2,230,252,96          NA
·470 DATA170,177,251,201,34,208,6,165,2,73       DM
·480 DATA255,133,2,165,2,208,218,177,251,201     JA
·490 DATA32,208,212,198,254,76,29,193,0,169      FM
·500 DATA13,76,210,255,0,0,0                     PA
```

COMMODORE 128 VERSION

```
·100 FAST:FOR X = 3072 TO 3520:READ Y:POKE X,Y
 :S=S+Y:TRAP110:NEXT:SLOW                        IH
·110 SLOW:IF S<>49057 THEN PRINT"[CLEAR][DOWN]
 **ERROR**":PRINT"[DOWN]PLEASE CHECK DATA LINE
 S 140-390":END                                  JA
·120 PRINT"[CLEAR][DOWN]  C-128 BUG REPELLENT
 INSTALLED"                                      II
·130 PRINT"[4" "]TYPE SYS 3072 TO ACTIVATE"     IN
·140 DATA 32,161,12,165,45,133,251,165,46,133,
 252,160,0,132,254,32,37                         OF
·150 DATA 13,234,177,251,208,3,76,138,12,230,2
 51,208,2,230,252,76,43                          NC
·160 DATA 12,76,73,78,69,32,35,32,0,169,35,160
 ,12,32,80,13,160,0,177                          OL
·170 DATA 251,170,230,251,208,2,230,252,177,25
 1,32,89,13,169,58,32,98                         EF
·180 DATA 13,169,0,133,253,230,254,32,37,13,23
 4,165,253,160,0,76,13                           JO
·190 DATA 13,133,253,177,251,208,237,165,253,4
 1,240,74,74,74,74,24                            LC
·200 DATA 105,65,32,98,13,165,253,41,15,24,105
 ,65,32,98,13,169,13,32                          DE
·210 DATA 220,12,230,65,208,2,230,66,230,251,2
 08,2,230,252,76,11,12                           GM
·220 DATA 169,153,160,12,32,80,13,166,65,165,6
 6,76,231,12,96,76,73,78                         CP
·230 DATA 69,83,58,32,0,169,247,160,12,32,80,1
 3,169,3,133,254,32,107                          HC
·240 DATA 13,201,83,240,6,201,80,208,245,230,2
 54,32,98,13,169,4,166                           GK
·250 DATA 254,160,255,32,116,13,169,0,133,65,1
 33,66,133,250,32,125,13                         LB
·260 DATA 32,134,13,166,254,32,143,13,76,73,13
 ,96,32,98,13,165,211                            JF
·270 DATA 234,41,1,208,249,96,32,89,13,169,13,
 32,98,13,32,152,13,169,4                        GD
·280 DATA 76,161,13,147,83,67,82,69,69,78,32,7
 9,82,32,80,82,73,78,84,69                       PL
·290 DATA 82,32,63,32,0,76,44,13,234,177,251,2
 01,32,240,6,138,113,251,69                      OK
·300 DATA 254,170,138,76,88,12,0,0,0,0,230,251
 ,208,2,230,252,96,170,177                       FJ
·310 DATA 251,201,34,208,6,165,250,73,255,133,
 250,165,250,208,218,177                         GA
·320 DATA 251,201,32,208,212,198,254,76,29,13,
 0,169,13,76,98,13,0,0,32                        FI
·330 DATA 170,13,32,226,85,76,180,13,32,170,13
 ,32,50,142,76,180,13,32                         OF
·340 DATA 170,13,32,210,255,76,180,13,32,170,1
 3,32,228,255,76,180,13,32                       AK
·350 DATA 170,13,32,186,255,76,180,13,32,170,1
 3,32,189,255                                    BP
·360 DATA 76,180,13,32,170,13,32,192,255,76,18
 0,13,32,170,13                                  FP
·370 DATA 32,201,255,76,180,13,32,170,13,32,20
 4,255,76,180,13,32,170                          ID
·380 DATA 13,32,195,255,76,180,13,133,67,169,0
 ,141,0,255,165,67,96                            BJ
·390 DATA 133,67,169,0,141,1,255,165,67,96,0,0
 ,0                                              IF
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1 – SAVEs what you have entered so far.

f3 – LOADs in a program worked on previously.

f5 – To continue on a line you stopped on after LOADing in the previous saved work.

f7 – Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. f7 temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                              LL
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";    ED
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                          MC
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"       DM
·120 PRINT"[RVSON][3" "]COPR. 1984, ION INTERNATIONAL INC.
 [3" "]"                                                     DH
·125 FORA=54272TO54296:POKEA,0:NEXT                         IM
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                                  NH
·135 FORA=680TO699:READB:POKEA,B:NEXT                       KO
·140 DATA169,251,166,253,164,254,32,216,255,96              HJ
·145 DATA169,0,166,251,164,252,32,213,255,96                JB
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B        HC
·155 GOSUB480:IFB=0THEN150                                  FO
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16              KE
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B               IF
·170 GOSUB470:IFB=0THEN150                                  FP
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16                  MN
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1                 GE
·185 POKE253,B:PRINT                                        HN
·190 REM  GET HEX LINE                                      IL
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8               FG
·200 FORB=0TO1:GOTO250                                      MD
·205 NEXTB                                                  ME
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340                  LH
·215 PRINT" [c P][LEFT]";                                   IK
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "                  PD
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255                 LK
·230 NEXT                                                   IA
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                         FK
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195          MN
·245 REM    GET HEX INPUT                                   AB
·250 GETA$:IFA$=""THEN250                                   HO
·255 IFA$=CHR$(20)THEN305                                   GC
·260 IFA$=CHR$(133)THEN535                                  MD
·265 IFA$=CHR$(134)THEN560                                  KF
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                     GE
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                     BJ
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295           GM
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295           LE
·290 GOSUB415:GOTO250                                       LL
·295 PRINTA$"[c P][LEFT]";                                  OA
·300 GOTO205                                                CG
·305 IFA>0THEN320                                           OP
·310 A=-1:IFB=1THEN330                                      OB
·315 GOTO220                                                CJ
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1                 HG
·325 A=A-1                                                  BE
·330 PRINTCHR$(20);:GOTO220                                 KH
·335 REM LAST LINE                                          AD
·340 PRINT" ":T=AD-(INT(AD/256)*256)                        GJ
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255               PL
·350 NEXT                                                   IA
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                         KF
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                        HN
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535                 ON
·370 REM BELL AND ERROR MESSAGES                            FL
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415    DH
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415        JA
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                           HD
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                                     AG
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415         KN
·400 PRINT"?ERROR IN SAVE":GOTO415                          EI
·405 PRINT"?ERROR IN LOAD":GOTO415                          GL
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT                PG
·415 POKE54276,17:POKE54276,16:RETURN                       BH
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN       IM
·425 REM GET FOUR DIGIT HEX                                 PC
·430 PRINT:PRINTB$;:INPUTT$                                 GM
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                       II
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                                 AD
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN    GF
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN            EH
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN            KP
·460 T(A)=16:RETURN                                         NP
·465 REM ADRESS CHECK                                       LI
·470 IFAD>ENTHEN385                                         MI
·475 IFB<SRORB>ENTHEN390                                    MG
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395           MI
·485 RETURN                                                 IM
·490 REM ADDRESS TO HEX                                     EB
·495 AC=AD:A=4096:GOSUB520                                  HG
·500 A=256:GOSUB520                                         CE
·505 A=16:GOSUB520                                          PN
·510 A=1:GOSUB520                                           MJ
·515 RETURN                                                 IM
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530             CJ
·525 A$=CHR$(T+48)                                          JP
·530 PRINTA$;:AC=AC-A*T:RETURN                              AC
·535 A$="**SAVE**":GOSUB585                                 AI
·540 OPEN1,T,1,A$:SYS680:CLOSE1                             LH
·545 IFST=0THENEND                                          EO
·550 GOSUB400:IFT=8THENGOSUB420                             FJ
·555 GOTO535                                                FF
·560 A$="**LOAD**":GOSUB585                                 AB
·565 OPEN1,T,0,A$:SYS690:CLOSE1                             MF
·570 IFST=64THEN195                                         JH
·575 GOSUB405:IFT=8THENGOSUB420                             CM
·580 GOTO560                                                FO
·585 PRINT" ":PRINTTAB(14)A$                                FG
·590 PRINT:A$="":INPUT"FILENAME";A$                         OM
·595 IFA$=""THEN590                                         GF
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                       DF
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN           IG
·610 IFB$<>"T"THEN605                                       FN
·615 RETURN                                                 IM
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B               DK
·625 GOSUB475:IFB=0THEN620                                  MA
·630 PRINT:GOTO195                                          OI
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B               FH
·640 GOSUB475:IFB=0THEN635                                  NK
·645 PRINT:GOTO670                                          DI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                             BK
·655 PRINT" ";:NEXTB                                        EC
·660 PRINT:AD=AD+8                                          GN
·665 GETB$:IFB$=CHR$(136)THEN195                            MN
·670 GOSUB495:PRINT": ";:GOTO650                            JD
```

SPRITE
FROM PAGE 85

Assembler required for entry! See introductory article.

```
*
* SPRITE
*
         ORG    $9000
*
COLOR    EQU    $E0
*
TABLEN   EQU    $800
MAPLEN   EQU    1000
SCRLEN   EQU    8000
SP0ADR   EQU    $8000
COLMAP   EQU    $8400
NEWADR   EQU    $8800
*
SPRPTR   EQU    $87F8
SPENA    EQU    $D015
SP0COL   EQU    $D027
SP0X     EQU    $D000
SP0Y     EQU    $D001
MSIGX    EQU    $D010
YXPAND   EQU    $D017
XXPAND   EQU    $D01D
*
HMAX     EQU    320
VMID     EQU    100-8
*
R6510    EQU    $0001
BASE     EQU    $A000
CHRBAS   EQU    $D000
VICTRL   EQU    $D011
VICMEM   EQU    $D018
BORDER   EQU    $D020
CIACRE   EQU    $DC0E
CI2PRA   EQU    $DD00
CIADIR   EQU    $DD02
*
TEMPA    EQU    $FB
TEMPB    EQU    TEMPA+2
TABPTR   EQU    TEMPA
*
MVSRCE   EQU    $61
MVDEST   EQU    MVSRCE+2
BYTPTR   EQU    MVDEST+2
*
TABSIZ   EQU    $02A7
*
HPSN     EQU    TABSIZ+2
VPSN     EQU    HPSN+2
CHAR     EQU    VPSN+1
ROW      EQU    CHAR+1
LINE     EQU    ROW+1
BYTE     EQU    LINE+1
BITT     EQU    BYTE+2
*
MPRL     EQU    BITT+1
MPRH     EQU    MPRL+1
MPDL     EQU    MPRH+1
MPDH     EQU    MPDL+1
PRODL    EQU    MPDH+1
PRODH    EQU    PRODL+1
FILVAL   EQU    PRODH+1
LENPTR   EQU    FILVAL+1
CHCODE   EQU    LENPTR+2
HPTR     EQU    CHCODE+2
VPTR     EQU    HPTR+2
ONEBYT   EQU    VPTR+1
COUNT    EQU    ONEBYT+2
LTTR     EQU    COUNT+1
*
         JMP    START
*
TEXT     DFB    9,32,32,32
         DFB    13,25,32,3
         DFB    15,13,13
         DFB    15,4,15,18
         DFB    5,32,54,52
         DFB    0
*
* BLOCK FILL ROUTINE
*
BLKFIL   LDA    FILVAL
         LDX    TABSIZ+1
         BEQ    PARTPG
         LDY    #0
FULLPG   STA    (TABPTR),Y
         INY
         BNE    FULLPG
         INC    TABPTR+1
         DEX
         BNE    FULLPG
PARTPG   LDX    TABSIZ
         BEQ    FINI
         LDY    #0
PARTLP   STA    (TABPTR),Y
         INY
         DEX
         BNE    PARTLP
FINI     RTS
*
* 16-BIT MULTIPLICATION
* ROUTINE
MULT16   LDA    #0
         STA    PRODL
         STA    PRODH
         LDX    #17
         CLC
MULT     ROR    PRODH
         ROR    PRODL
         ROR    MPRH
         ROR    MPRL
         BCC    CTDOWN
         CLC
         LDA    MPDL
         ADC    PRODL
         STA    PRODL
         LDA    MPDH
         ADC    PRODH
         STA    PRODH
CTDOWN   DEX
         BNE    MULT
         RTS
*
* PLOT ROUTINE
*
* ROW=VPSN/8
* (8-BIT DIVIDE)
PLOT     LDA    VPSN
         LSR    A
         LSR    A
         LSR    A
         STA    ROW
*
* CHAR=HPSN/8
* (16-BIT DIVIDE)
         LDA    HPSN
         STA    TEMPA
         LDA    HPSN+1
         STA    TEMPA+1
         LDX    #3
DLOOP    LSR    TEMPA+1
         ROR    TEMPA
         DEX
         BNE    DLOOP
         LDA    TEMPA
         STA    CHAR
*
* LINE=VPSN AND 7
*
         LDA    VPSN
         AND    #7
         STA    LINE
*
* BITT=7-(HPSN AND 7)
*
         LDA    HPSN
         AND    #7
         STA    BITT
         SEC
         LDA    #7
         SBC    BITT
         STA    BITT
*
* BYTE=BASE+ROW*HMAX
* +8*CHAR+LINE
* FIRST MULTIPLY
* ROW * HMAX
         LDA    ROW
         STA    MPRL
```

```
         LDA   #0
         STA   MPRH
         LDA   #<HMAX
         STA   MPDL
         LDA   #>HMAX
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPA
         LDA   MPRL+1
         STA   TEMPA+1
*
* ADD PRODUCT TO BASE
*
         CLC
         LDA   #<BASE
         ADC   TEMPA
         STA   TEMPA
         LDA   #>BASE
         ADC   TEMPA+1
         STA   TEMPA+1
*
* MULTIPLY 8 * CHAR
*
         LDA   #8
         STA   MPRL
         LDA   #0
         STA   MPRH
         LDA   CHAR
         STA   MPDL
         LDA   #0
         STA   MPDH
         JSR   MULT16
         LDA   MPRL
         STA   TEMPB
         LDA   MPRH
         STA   TEMPB+1
*
* ADD LINE
*
         CLC
         LDA   TEMPB
         ADC   LINE
         STA   TEMPB
         LDA   TEMPB+1
         ADC   #0
         STA   TEMPB+1
*
* TEMPA + TEMPB = BYTE
*
         CLC
         LDA   TEMPA
         ADC   TEMPB
         STA   TEMPB
         LDA   TEMPA+1
         ADC   TEMPB+1
         STA   TEMPB+1
*
* POKE BYTE,PEEK(BYTE)
* OR2^BIT
         LDX   BITT
         INX
         LDA   #0
         SEC
SQUARE   ROL
         DEX
         BNE   SQUARE
         LDY   #0
         ORA   (TEMPB),Y
         STA   (TEMPB),Y
         RTS
*
* CALCULATE CHCODE'S
* ADDRESS
GETADR   LDA   #0
         STA   CHCODE+1
         LDA   CHCODE
         CLC
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         ASL   A
         ROL   CHCODE+1
         STA   CHCODE
*
         CLC
         LDA   CHCODE
         ADC   #<NEWADR
         STA   BYTPTR
         LDA   CHCODE+1
         ADC   #>NEWADR
         STA   BYTPTR+1
         RTS
*
* DRAW A CHARACTER
*
DRAWCH   LDA   LTTR
         STA   CHCODE
         JSR   GETADR
*
* A NESTED LOOP:
*
* (X IS THE OUTSIDE
* LOOP)
         LDX   #8
*
* SET UP COUNTER FOR
* 2 VERT LINES
SETLIN   LDA   #2
         STA   COUNT
*
DRAWLN   LDY   #0
         LDA   (BYTPTR),Y
         STA   ONEBYT
*
* THE INSIDE LOOP:
*
* (Y IS ZERO AT START)
*
RSHIFT   LDA   ONEBYT
         ASL   A
         STA   ONEBYT
         BCS   SHOW
*
         INC   HPSN
         BNE   ITSOK
         INC   HPSN+1
ITSOK    JMP   NOSHOW
*
* DISPLAY BIT
*
* SAVE X AND Y REGISTERS
*
SHOW     TXA
         PHA
         TYA
         PHA
*
         JSR   PLOT
*
* NOW DO IT AGAIN
*
         INC   HPSN
         BNE   NOINC
         INC   HPSN+1
*
NOINC    JSR   PLOT
*
* RETRIEVE X AND Y
* REGISTERS
         PLA
         TAY
         PLA
         TAX
*
NOSHOW   INC   HPSN
         BNE   LEAP
         INC   HPSN+1
*
LEAP     INY
         CPY   #8
         BCC   RSHIFT
*
         INC   VPSN
*
         LDA   HPTR
         STA   HPSN
         LDA   HPTR+1
         STA   HPSN+1
*
* 2 VERT LINES DONE YET?
*
         DEC   COUNT
```

```
         BNE   DRAWLN
*
         INC   BYTPTR
         BNE   OKMSB
         INC   BYTPTR+1
OKMSB    DEX
         BNE   SETLIN
         RTS
*
* MAIN ROUTINE STARTS
* HERE
START    LDA   VICMEM
         ORA   #8
         STA   VICMEM
*
         LDA   VICTRL
         ORA   #32
         STA   VICTRL
*
* USE BANK 2
*
         LDA   CIADIR
         ORA   #3
         STA   CIADIR
*
         LDA   CI2PRA
         AND   #252
         ORA   #1
* BANK 2
         STA   CI2PRA
*
* CLEAR BIT MAP
*
         LDA   #0
         STA   FILVAL
         LDA   #<BASE
         STA   TABPTR
         LDA   #>BASE
         STA   TABPTR+1
         LDA   #<SCRLEN
         STA   TABSIZ
         LDA   #>SCRLEN
         STA   TABSIZ+1
         JSR   BLKFIL
*
* SET LINE, BKG AND
* BORDER COLORS
         LDA   #COLOR
         STA   FILVAL
         LDA   #<COLMAP
         STA   TABPTR
         LDA   #>COLMAP
         STA   TABPTR+1
         LDA   #<MAPLEN
         STA   TABSIZ
         LDA   #>MAPLEN
         STA   TABSIZ+1
         JSR   BLKFIL
         LDA   #13
* GREEN
         STA   BORDER
*
* MOVE CHARACTER SET
* INTO RAM
* THIS ROUTINE TURNS
* BASIC OFF
         LDA   R6510
         AND   #$FE
         STA   R6510
*
* TURN OFF KB INTERRUPT
* TIMER
         LDA   CIACRE
         AND   #$FE
         STA   CIACRE
*
* SWITCH I/O OUT, CHAR
* ROM IN
         LDA   R6510
         AND   #$FB
         STA   R6510
*
* COPY CHARACTERS INTO
* RAM
         LDA   #<CHRBAS
         STA   MVSRCE
         LDA   #>CHRBAS
         STA   MVSRCE+1
*
         LDA   #<NEWADR
         STA   MVDEST
         LDA   #>NEWADR
         STA   MVDEST+1
*
         LDA   #<TABLEN
         STA   LENPTR
         LDA   #>TABLEN
         STA   LENPTR+1
*
* START MOVE
*
         LDY   #0
         LDX   LENPTR+1
         BEQ   MVPART
MVPAGE   LDA   (MVSRCE),Y
         STA   (MVDEST),Y
         INY
         BNE   MVPAGE
         INC   MVSRCE+1
         INC   MVDEST+1
         DEX
         BNE   MVPAGE
MVPART   LDX   LENPTR
         BEQ   MVEXIT
MVLAST   LDA   (MVSRCE),Y
         STA   (MVDEST),Y
         INY
         DEX
         BNE   MVLAST
MVEXIT
*
* SWITCH I/O BACK IN
*
         LDA   R6510
         ORA   #4
         STA   R6510
*
* TURN TIMER BACK ON
*
         LDA   CIACRE
         ORA   #1
         STA   CIACRE
*
* POSITION MESSAGE ON
* SCREEN
         LDA   #8
         STA   HPSN
         STA   HPTR
         LDA   #0
         STA   HPSN+1
         STA   HPTR+1
         LDA   #VMID
         STA   VPSN
         STA   VPTR
*
* PRINT LINE OF LARGE
* TYPE
         LDX   #0
DISP     LDA   TEXT,X
         CMP   #0
* EOF
         BEQ   DONE
         STA   LTTR
         TXA
         PHA
         JSR   DRAWCH
         PLA
         TAX
*
* ADVANCE CURSOR
*
         CLC
         LDA   HPTR
         ADC   #16
         STA   HPTR
         STA   HPSN
         LDA   HPTR+1
         ADC   #0
         STA   HPTR+1
         STA   HPSN+1
         LDA   VPTR
         STA   VPSN
*
* PRINT NEXT LETTER
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
*
         INX
         JMP    DISP
*
DONE
*
* DISPLAY SPRITE #0
*
* DEFINE SPRITE
*
* CLEAR SPRITE MAP
*
         LDA    #0
         STA    FILVAL
         LDA    #<SP0ADR
         STA    TABPTR
         LDA    #>SP0ADR
         STA    TABPTR+1
         LDA    #64
         STA    TABSIZ
         LDA    #0
         STA    TABSIZ+1
         JSR    BLKFIL
*
* (COPY HEART FROM C64
* CHAR SET)
         LDA    SP0ADR
         STA    TEMPA
         LDA    #83
* HEART
         STA    CHCODE
         JSR    GETADR
*
         LDY    #0
         LDX    #8
*
DEFSP0   LDA    (BYTPTR),Y
         STA    (TEMPA),Y
*
         INC    BYTPTR
         INC    TEMPA
         INC    TEMPA
         INC    TEMPA
*
         DEX
         BNE    DEFSP0
*
* STORE SPRITE'S ADDRESS
* IN PTR
* (ADDRESS IS $8000)
* (NO OFFSET)
         LDA    #0
         STA    SPRPTR
*
* EXPAND SPRITE
* (VERT & HORZ)
         LDA    #1
         STA    XXPAND
         STA    YXPAND
*
* TURN ON SPRITE #0
*
         LDA    #1
         STA    SPENA
*
* MAKE SPRITE RED
*
         LDA    #10
* RED
         STA    SP0COL
*
* POSITION SPRITE
* ON SCREEN
         LDA    #62
         STA    SP0X
         LDA    #0
         STA    MSIGX
         LDA    #34
         STA    SP0Y
*
* MOVE SPRITE DOWN
* SCREEN
DROP     INC    SP0Y
*
* DELAY LOOP
*
         LDX    #$FF
XLOOP    LDY    #$10
YLOOP    DEY
         BNE    YLOOP
         DEX
         BNE    XLOOP
*
         LDA    SP0Y
         CMP    #142
         BNE    DROP
*
INF      JMP    INF
*
         END
```

BIG PRINT
FROM PAGE 49

```
•10 IFPEEK(49152)=165ANDPEEK(50056)=251TH
 EN80                                        KA
•20 POKE53280,0:POKE53281,1:PRINT"[CLEAR]
 [BLACK][3"[DOWN]"][6" "][RVSON]30 SECOND
 S FOR ML SET UP[4"."]"                      KJ
•30 PRINT"[DOWN]"TAB(20);:POKE204,0          BK
•40 READA:IFA<>9999THEN40                    EL
•50 H=64:L=48:S=7:X=16:N=1                   JA
•60 FORI=49152TO50057:READA$:A=ASC(A$):B=
 ASC(RIGHT$(A$,N))                           FE
•70 P=X*((A-L)+S*(A>H))+B-L+S*(B>H):POKEI
 ,P:NEXT:POKE204,1                           OE
•80 RT$=CHR$(13):BP=49152:CL=59903:BC=596
 10                                          LP
•90 TP$=CHR$(164):BT$=CHR$(183):FORI=1TO5
 :TP$=TP$+TP$:BT$=BT$+BT$:NEXT               BP
•100 TP$=TP$+RT$:S8$="[8" "]":UP$="[13"[U
 P]"]"                                       BP
•110 AC$="[5"[RIGHT]"]":DN$="[12"[DOWN]"]
 "                                           LO
•120 SA$=S8$+"  "                            EO
•130 POKE53280,0:POKE53281,1:GOSUB1750       JP
•140 PRINT"[BLACK][008][142]"TAB(9)"[RVSO
 N] BIG PRINT FUNCTIONS "                    AG
•150 PRINTTAB(9)LEFT$(BT$,21)                AG
•160 PRINT"[DOWN]"TAB(4)TP$SPC(4)"[RVSON]
 PLEASE CHOOSE ANY OPTION BELOW "            MF
•170 D$="[RVSON] [D] [s *][s *] DEMONSTRA
 TION[3" "]":V$="[RVSON] [V] [s *][s *] V
 IEW CHARACTERS "                            PH
•180 Q$="[RVSON] [Q] [s *][s *] QUIT[12"
 "]":S$="[RVSON] [S] [s *][s *] SAVE ML P
 ROGRAM "                                    KI
•190 T2$=S8$+RIGHT$(TP$,25)+S8$              KB
•200 PRINT"[DOWN]"T2$D$"[DOWN][RVSOFF]"SP
 C(8)T2$Q$                                   FD
```

```
•210 PRINT"[DOWN]"T2$S$"[DOWN][RVSOFF]"SP
 C(8)T2$V$                                LL
•220 PRINTUP$:FORI=1TO14:PRINTTAB(4)"[RVS
 ON] "SPC(30)"[RVSON] ":NEXT              DE
•230 PRINTSPC(4)"[RVSON]"S8$S8$S8$S8$     LC
•240 PRINTUP$"[UP][UP]"AC$"[sEP]"SPC(28)"
 [c *]":PRINTDN$AC$"[RVSON][c *][RVSOFF]"
 SPC(20)S8$"[RVSON][sEP]"                 BC
•250 GETA$:IFA$=""THEN250                 HK
•260 IFA$="D"ORA$=RT$THENUP=13:M$=D$:GOTO
 310                                      CG
•270 IFA$="S"THENUP=7:M$=S$:GOTO330       IK
•280 IFA$="Q"THENUP=10:M$=Q$:GOTO510      NI
•290 IFA$<>"V"THEN250                     FN
•300 UP=4:M$=V$                           IM
•310 PRINTLEFT$(UP$,UP)SPC(8)"[RED]"RIGHT
 $(TP$,25)SPC(8)M$"[BLACK]"               HP
•320 FORI=1TOUP-1:PRINT:NEXT:ON(UP-1)/3GO
 TO520,510,520,930                        KE
•330 B=0:E=24:GOSUB1710                   GH
•340 PRINT"[CLEAR]"TAB(11)"[RVSON] SAVE M
 L PROGRAM "RT$TAB(11)LEFT$(BT$,17)       NJ
•350 PRINTTAB(10)LEFT$(DN$,8);:INPUT"FILE
  NAME[3" "]BIGPRINTML[12"[LEFT]"]";NM$   CF
•360 PRINTTAB(10)"[DOWN][DOWN]";:INPUT"DE
 VICE[3"."][3" "]8[3"[LEFT]"]";DV$:DV=VAL
 (DV$):NM$=LEFT$(NM$,16)                  NL
•370 PRINT"[DOWN]"TAB(20)"  "LEFT$(TP$,LE
 N(NM$))                                  FB
•380 PRINTAC$AC$"NOW  SAVING [RVSON]"NM$  DI
•390 DV$="N":IFDV>7ANDDV<12THENDV$="Y":OP
 EN1,DV,15,"I0":PRINT#1,"S0:"+NM$:CLOSE1  NJ
•400 SYS57812 NM$,DV,1:POKE193,0:POKE194,
 192:POKE174,138:POKE175,195:SYS62957     EK
•410 IFDV$="N"THEN130                     NN
•420 PRINT"[DOWN]"TAB(20)"  "LEFT$(TP$,LE
 N(NM$))                                  FB
•430 PRINTTAB(10)"VERIFYING.. [RVSON]"NM$ EF
•440 POKE147,1:SYS57812 NM$,DV,1:SYS62631
 :IFST=64THEN490                          OO
•450 PRINTAC$"[DOWN][DOWN]VERIFY ERROR -
 TRY AGAIN [Y/N?]"                        LF
•460 GETA$:IFA$="Y"THEN330                OP
•470 IFA$="N"THEN130                      GC
•480 GOTO460                              CK
•490 FORI=0TO15:POKE646,I:SYSBP,"-OK-",3,
 12:FORJ=1TO50:NEXT:NEXT:POKE646,0        EE
•500 GOTO130                              CA
•510 B=0:E=24:GOSUB1710:SYSBP,"BYE!",8,12
 :PRINT"[HOME]"DN$"RUN[3"[UP]"]":END      IO
•520 LN$="":FORI=1TO26:LN$=LN$+"[c I]":NE
 XT:CS$="CHARACTER  SET"                  MC
•530 H1$="[s U][10"[s *]"][s I]"+RT$:H2$=
 "[s J][10"[s *]"][s K]":IM$="[s -]  IMAG
 E[3" "][s -]"+RT$                        GJ
•540 C1$(1)="[3" "]STANDARD CHARACTER  "  OP
•550 C1$(2)="[8" "]INVERTED[8" "]":C2$(2)
 =".[s I]."                               ID
•560 C1$(3)="[6" "]UPSIDE  DOWN":C2$(3)="
 .[s U]."                                 HP
•570 C1$(4)="UPSIDE DOWN AND INVERTED":C2
 $(4)=".[s U][s I]."                      MN
•580 C1$(5)="[6" "]ROTATED LEFT[6" "]":C2
 $(5)=".[s L]."                           CE
•590 C1$(6)="[5" "]ROTATED  RIGHT[5" "]":
 C2$(6)=".[s R]."                         HA
•600 AW$=AC$+AC$+"[RIGHT][RVSON][sEP][RVS
 OFF][c O][c O]"+AC$+AC$+"[RIGHT][RIGHT][
 c O][c O][RVSON][c *]"+RT$+AC$+AC$+"[RIG
 HT][c *][c U][c U]"+AC$+AC$+"[RIGHT][RIG
 HT][c U][c U][sEP]"                      GL
•610 GOSUB1750:PRINTTAB(9)"[RVSON] VIEW L
 ARGE CHARACTERS "                        HA
•620 PRINTTAB(9)LEFT$(BT$,23)"[UP]"       ME
•630 FORI=1TO21:PRINTTAB(19)"[RVSON]  ":N
 EXT:PRINT"[HOME][DOWN][DOWN]  UPPER/GRAP
 HICS";                                   IP
•640 PRINTSPC(7)"UPPER/LOWER CASE":PRINTS
 PC(2)CS$SPC(8)CS$"[DOWN]"                NI
•650 PRINT"[RVSON][7" "]"LN$"[RVSON][7" "
 ]";                                      OI
•660 PRINTSPC(6)"[RVSON] [RVSOFF]"SPC(26)
 "[RVSON] ":PRINTSPC(6)"[RVSON] [RVSOFF]"
 LN$"[RVSON] "                            IN
•670 PRINT"[DOWN]"TAB(14)H1$SPC(14)"[s -]
  REGULAR  [s -]"RT$TAB(14)IM$SPC(14)H2$  BD
•680 PRINT"[DOWN][DOWN][RVSON]"SPC(14)H1$
 SPC(14)"[RVSON][s -] REVERSE  [s -]"RT$T
 AB(14)"[RVSON]"IM$SPC(14)"[RVSON]"H2$    BN
•690 PRINT"[DOWN][DOWN][3" "][RVSON][c D]
 [8"[s F]"]"LEFT$(LN$,24)"[c F]":PRINTTAB
 (3)"[c K]"SPC(32)"[RVSON][c K]"          PM
•700 PRINTTAB(3)"[c K]"SPC(32)"[RVSON][c
 K]";                                     AJ
•710 PRINT"[UP][UP]":PRINTTAB(4)"[RVSON]
  CTRL  [RVSOFF] CHANGES CHARACTER COLOR" JE
•720 PRINTTAB(4)"[RVSON]SPACEBAR[RVSOFF]
 CYCLES  DISPLAY OPTIONS"                 NP
•730 PRINTTAB(3)"[c K][RVSON] RETURN [RVS
 OFF] EXITS[3" "]TO MAIN MENU[3" "][RVSON
 ][c K]";                                 DP
•740 BX$="[HOME][RVSOFF]"+LEFT$(DN$,6)+AC
 $+LEFT$(AC$,3):SM$="  PRESS A KEY TO BEG
 IN"                                      FD
•750 PRINTBX$"[GREEN]"SM$"[BLACK]"        GA
•760 PRINT"[3"[DOWN]"]"AW$RT$"[4"[DOWN]"]
 "AW$:RESTORE                             LE
•770 READX:IFX=9999THEN800                PP
•780 IFX<1024THENP=X:GOTO770              ME
•790 POKEX,P:POKE(X-1024)+55296,.:GOTO770 JA
•800 C$="1":CM=1:CG$=C2$(CM):FT=0         BA
•810 GETB$:IFB$=RT$THEN130                MO
•820 IFB$<>""ANDB$<>" "THENC$=B$:GOTO890  LJ
•830 IFB$=" "THENFT=FT+1:IFFT=1THENCM=0   CB
•840 IFB$=" "THENCM=CM+1-(-6*(CM=6)):GOTO
 880                                      GC
```

```
·850 IFPEEK(653)<>4THEN810                          BK
·860 IFCC=0THENCC=1                                 AN
·870 CC=(CC+1)AND15:GOTO890                         FJ
·880 CG$=C2$(CM)                                    PD
·890 D1$=CG$+C$:D2$="[RVSON]"+CG$+C$:D3$=
"[014]"+CG$+C$:D4$="[014][RVSON]"+CG$+C$
:POKE646,CC                                         MK
·900 PRINTBX$"[BLACK]"C1$(CM):POKE646,CC            AH
·910 SYSBP,D1$,9,4,,46;D2$,15,4,,46;D3$,9
,32,,46;D4$,15,32,,46                               KM
·920 GOTO810                                        CN
·930 UL$=AC$+"[3"[RIGHT]"]":FORI=1TO23:UL
$=UL$+"[c U]":NEXT:MS$="[HOME][RVSOFF][3
"[DOWN]"]"+LEFT$(UL$,8)                             KO
·940 BG$="[4"[DOWN]"][4"[LEFT]"]":G1$="":
FORI=1TO4:G1$=G1$+MID$("GOOD",I,1)+BG$:N
EXT                                                 MK
·950 BG$="[4"[LEFT]"][4"[DOWN]"]":G2$="":
FORI=1TO4:G2$=G2$+MID$("GOOD",I,1)+BG$:N
EXT                                                 NP
·960 POKE53280,2:PRINT"[CLEAR][RED]"SPC(7
)"[RVSON] BIG PRINT DEMONSTRATION "                 BP
·970 PRINTSPC(7)LEFT$(BT$,25)                       BL
·980 PRINTDN$LEFT$(DN$,8)SPC(4)"[RVSON][c
 D][10"[s F]"][20"[c I]"][c F]"                     IH
·990 PRINTSPC(4)"[c K][RVSON] SPACEBAR [R
VSOFF] [BLUE]CONTINUES THE DEMO [RED][RV
SON][c K]"                                          EL
·1000 PRINTSPC(4)"[c K][RVSON]  RETURN  [
RVSOFF] [BLUE]EXITS TO MAIN MENU [RVSON]
[RED][c K]";                                        FE
·1010 J=0:FORI=1TO3:CB$(I)="[RVSON]":GOSU
B1020:NEXT:GOTO1050                                 OO
·1020 K=4:IFJ=0THENK=5                              NI
·1030 FORJ=JTOJ+K:CB$(I)=CB$(I)+CHR$(PEEK
(BC+J))+" ":IFJ=0THENJ=1                            GO
·1040 NEXT:RETURN                                   EJ
·1050 PRINTMS$RT$UL$:CM$="A STANDARD MESS
AGE":GOSUB1720:SYSBP,"HELLO!",10,8                  PA
·1060 GOSUB1730:IFA$=RT$THEN130                     DH
·1070 CM$="A MULTI-COLOR MESSAGE":GOSUB17
20:SYSBP,".[s A][RED][GREEN].HELLO!",10,
8,,"."                                              NG
·1080 GOSUB1730:IFA$=RT$THEN130                     DH
·1090 CM$="MULTI-COLOR REVERSED":GOSUB172
0                                                   NO
·1100 SYSBP,".[s A][RED][GREEN][RVSON].HE
LLO!",10,8,,".";".[s A][RED][GREEN].[6"[
c @]"]",6,8,,"."                                    DG
·1110 GOSUB1730:IFA$=RT$THEN130                     DH
·1120 CM$="A FLASHING MESSAGE":GOSUB1720:
POKE781,9:SYSCL                                     LM
·1130 X$(1)=SA$:X$(2)="FLASHING":X=1                PA
·1140 X=3-X:SYSBP,X$(X),10,4:FORI=1TO150:
NEXT                                                KC
·1150 GETA$:IFA$=""THEN1140                         KE
·1160 IFA$=RT$THEN130                               LO
·1170 CM$="ALTERNATING COLORS 1":GOSUB172
0                                                   LG
·1180 X$(1)="[RED]":X$(2)="[GREEN]":X=1:C
A$="ALT COLORS"                                     HL
·1190 X=3-X:SYSBP,X$(X)+CA$,10,,".":FORI
=1TO150:NEXT                                        JI
·1200 GETA$:IFA$=""THEN1190                         KH
·1210 IFA$=RT$THEN130                               LO
·1220 CM$=LEFT$(CM$,19)+"2":GOSUB1720               IN
·1230 X$(1)=".[s A][RED][GREEN].":X$(2)="
.[s A][GREEN][RED]."                                FA
·1240 X=3-X:SYSBP,X$(X)+CA$,10,,".":FORI
=1TO150:NEXT                                        JI
·1250 GETA$:IFA$=""THEN1240                         KB
·1260 IFA$=RT$THEN130                               LO
·1270 B=10:E=14:GOSUB1710                           IC
·1280 CM$="STANDARD COUNTER":GOSUB1720:CV
=15                                                 PC
·1290 GOSUB1760:SYSBP,CV$,10,15:FORI=1TO1
75:NEXT:GETA$:IFA$=""THEN1290                       JO
·1300 IFA$=RT$THEN130                               LO
·1310 CM$="COUNTER WITH OVERLAY":GOSUB172
0:CV=15                                             OA
·1320 GOSUB1760:SYSBP,".[s O]."+CV$,10,15
,,".":FORI=1TO15:NEXT:SYSBP,CV$,10,15               AN
·1330 FORI=1TO175:NEXT:GETA$:IFA$=""THEN1
320                                                 IJ
·1340 IFA$=RT$THEN130                               LO
·1350 CM$="WHAT'S THE ANSWER?":GOSUB1720:
FORI=10TO14:POKE781,I:SYSCL:NEXT                    AD
·1360 X=INT(RND(.)*10):Y=INT(RND(.)*(10-X
)):IFX=.ORY=.THEN1360                               JN
·1370 SYSBP,STR$(X),6,14;STR$(Y),11,14;"+
",9,12;"[4"[c Y]"]",15,12                           MC
·1380 GETA$:IFA$=""THEN1380                         KC
·1390 IFA$=" "THEN1470                              IP
·1400 IFA$=RT$THEN130                               LO
·1410 IFA$<"0"ORA$>"9"THEN1380                      NG
·1420 SYSBP,A$,17,18:IFVAL(A$)=X+YTHEN144
0                                                   EA
·1430 SYSBP,"[RED]NO.[s I].[BACKARROW]",1
7,5,,46:CM$="SORRY - TRY AGAIN?":GOSUB17
20:GOTO1460                                         HM
·1440 SYSBP,G1$,5;G1$,5,36                          BK
·1450 CM$="CORRECT - TRY AGAIN?":GOSUB172
0                                                   JI
·1460 GETA$:IFA$=""THEN1460                         LN
·1470 B=5:E=20:GOSUB1710                            GG
·1480 IFA$="Y"THEN1350                              MG
·1490 IFA$=RT$THEN130                               LO
·1500 CM$="COLOR BARS":GOSUB1720                    DH
·1510 FORI=1TO3:SYSBP,CB$(I),(I*5)+1,6,2,
46:NEXT                                             NF
·1520 GOSUB1730:IFA$=RT$THEN130                     DH
·1530 B=5:E=21:GOSUB1710                            GL
·1540 CM$="A MOVING MESSAGE":GOSUB1720:MM
$="MOVING"                                          JP
```

```
1550 FORI=6TO17:SYSBP,MM$,I,8:POKE781,I-1:SYSCL:FORJ=1TO100:NEXT:NEXT   IN
1560 IFPEEK(198)>0THEN1580   KM
1570 FORI=16TO6STEP-1:SYSBP,MM$,I,8:POKE781,I+4:SYSCL:FORJ=1TO100:NEXT:NEXT   DE
1580 GETA$:IFA$=""THEN1550   NP
1590 IFA$=RT$THEN130   LO
1600 B=5:E=20:GOSUB1710   GG
1610 CM$="A JUMPING MESSAGE":GOSUB1720   BD
1620 J$(1)="J[DOWN]U[UP]M[DOWN]P[UP]I[DOWN]N[UP]G":J$(2)="[DOWN]J[UP]U[DOWN]M[UP]P[DOWN]I[UP]N[DOWN]G":WH=1   AH
1630 WH=3-WH:FORI=10TO14STEP4:POKE781,I:SYSCL:NEXT:SYSBP,J$(WH),10,3,1   GB
1640 FORI=1TO100:NEXT   JG
1650 GETA$:IFA$=""THEN1630   LO
1660 IFA$=RT$THEN130   LO
1670 B=10:E=14:GOSUB1710:GOTO1050   GI
1680 K=4:IFJ=0THENK=5   NI
1690 FORJ=JTOJ+K:CB$(I)=CB$(I)+CHR$(PEEK(BC+J))+" ":IFJ=0THENJ=1   GO
1700 NEXT:RETURN   EJ
1710 FORI=BTOE:POKE781,I:SYSCL:NEXT:RETURN   OE
1720 NS=((23-LEN(CM$))/2):PRINT"[BLUE]"MS$LEFT$(S8$,NS)CM$S8$:RETURN   LK
1730 GETA$:IFA$=""THEN1730   LH
1740 RETURN   IM
1750 FORI=24TO0STEP-1:POKE781,I:SYSCL:NEXT:PRINT"[CLEAR]";:RETURN   OA
1760 IFCV=0THENIV=1   DH
1770 IFCV=15THENIV=-1   CN
1780 CV=CV+IV:CV$=RIGHT$(STR$(CV),2):RETURN   OI
1790 DATA 105,1024,1264,223,1184,1205,1845,1984,233,1202,1223,1842,2023   KP
1800 DATA 95,1063,1303,249,1403,1404,248,1523,1524,9999   CB
1810 DATA A5,D1,48,A5,D2,48,20,FD,AE,20   HK
1820 DATA 9E,AD,24,0D,30,05,A2,16,4C,37   DJ
1830 DATA A4,A0,00,B1,64,D0,06,20,F8,A8   LD
1840 DATA 4C,CF,C0,85,D7,C8,B1,64,85,FB   NJ
1850 DATA C8,B1,64,85,FC,A5,64,A4,65,20   OP
1860 DATA DB,B6,20,05,C1,90,04,A5,D6,B0   AJ
1870 DATA 06,A9,16,20,D6,C0,8A,48,20,05   AB
1880 DATA C1,90,15,A5,D3,AA,C9,28,90,05   BD
1890 DATA E9,28,B8,50,F6,A9,25,85,FF,20   CK
1900 DATA F6,C0,90,05,A9,25,20,D6,C0,86   OG
1910 DATA FF,68,AA,20,F0,E9,18,A5,D1,65   HI
1920 DATA FF,85,D1,90,02,E6,D2,20,24,EA   OB
1930 DATA A9,21,20,D6,C0,86,CE,20,15,C1   NH
1940 DATA 90,35,D0,0D,A9,00,85,9E,20,24   AL
1950 DATA C1,20,73,00,4C,09,C0,20,FD,AE   LK
1960 DATA 20,9E,AD,24,0D,30,08,20,A1,B7   GG
1970 DATA 86,9E,4C,BB,C0,A0,00,B1,64,F0   JJ
1980 DATA 0E,C8,B1,64,85,FD,C8,B1,64,85   PO
1990 DATA FE,A0,00,B1,FD,85,9E,A5,64,A4   NO
2000 DATA 65,20,DB,B6,20,15,C1,90,02,F0   DB
2010 DATA C1,20,F8,A8,20,24,C1,68,85,D2   FN
2020 DATA 68,85,D1,60,85,FF,20,15,C1,90   LN
2030 DATA 0C,F0,0A,20,FD,AE,20,79,00,C9   NJ
2040 DATA 2C,D0,03,A2,00,60,20,9E,AD,24   FL
2050 DATA 0D,30,0D,20,A1,B7,E4,FF,90,05   AM
2060 DATA A2,0E,4C,37,A4,60,A2,16,4C,37   IE
2070 DATA A4,A0,01,B1,7A,C9,AC,F0,02,18   AO
2080 DATA 60,20,FD,AE,4C,73,00,20,79,00   GI
2090 DATA F0,08,49,3A,F0,04,C9,01,38,60   AC
2100 DATA 18,60,A9,00,85,BF,AE,86,02,86   HF
2110 DATA 6E,86,6F,85,FD,AD,18,D0,29,02   FG
2120 DATA 0A,0A,09,D0,85,FE,AD,0E,DC,29   BO
2130 DATA FE,8D,0E,DC,A0,FF,84,69,C8,84   OL
2140 DATA CF,84,BE,A5,CE,20,17,C3,2C,11   IK
2150 DATA D0,10,FB,A4,69,C8,84,69,B1,FB   JD
2160 DATA C5,9E,D0,09,A5,BF,49,80,85,BF   JO
2170 DATA 4C,E1,C1,B8,C9,12,F0,35,C9,92   GM
2180 DATA F0,37,C9,0E,F0,39,C9,8E,F0,39   LP
2190 DATA C9,91,F0,3B,C9,11,F0,3B,C9,1D   JG
2200 DATA F0,3B,C9,9D,F0,3E,20,31,C3,10   BA
2210 DATA 50,24,BF,10,56,C9,C1,F0,38,A2   JI
2220 DATA 08,DD,6F,C3,F0,37,CA,10,F8,30   DB
2230 DATA 46,A9,80,85,CF,50,36,A9,00,85   IC
2240 DATA CF,50,30,A9,D8,50,02,A9,D0,85   NE
2250 DATA FE,50,26,A9,28,50,0D,A9,28,50   BD
2260 DATA 02,A9,01,20,FD,C2,50,17,A9,01   IP
2270 DATA 20,17,C3,50,10,A9,01,85,70,D0   MO
2280 DATA 0A,A5,BF,1D,78,C3,3D,81,C3,85   IL
2290 DATA BF,C6,D7,D0,03,4C,F4,C2,4C,57   OJ
2300 DATA C1,A2,07,DD,4F,C3,B0,03,CA,D0   JE
2310 DATA F8,5D,57,C3,05,CF,A2,00,86,6B   LL
2320 DATA 0A,26,6B,0A,26,6B,0A,26,6B,65   HN
2330 DATA FD,85,6A,A5,6B,65,FE,85,6B,A5   GA
2340 DATA 01,29,FB,85,01,A0,07,B1,6A,99   NL
2350 DATA 61,00,88,10,F8,24,BF,50,14,A2   BM
2360 DATA 00,A0,03,B5,61,48,B9,65,00,95   PJ
2370 DATA 61,68,99,65,00,E8,88,10,F0,A9   EN
2380 DATA 20,24,BF,F0,0F,A2,07,A0,08,16   NL
2390 DATA 61,6A,88,D0,FA,95,61,CA,10,F3   OJ
2400 DATA A9,10,24,BF,F0,03,B8,50,07,4A   CI
2410 DATA 24,BF,F0,1F,69,7F,A0,07,A2,07   LE
2420 DATA 70,05,56,61,6A,50,03,16,61,2A   HF
2430 DATA CA,10,F3,48,88,10,ED,A2,07,68   FL
2440 DATA 95,61,CA,10,FA,A5,01,09,04,85   BL
2450 DATA 01,A9,00,85,6C,18,A5,BE,65,CE   EP
2460 DATA A8,A9,04,85,6D,A6,6C,A9,00,36   MO
2470 DATA 61,2A,36,61,2A,36,62,2A,36,62   BB
2480 DATA 2A,85,FF,A5,BF,29,04,F0,13,A6   PN
2490 DATA FF,F0,1B,B1,D1,A2,0F,DD,5F,C3   KI
2500 DATA F0,05,CA,10,F8,30,0D,8A,05,FF   CI
2510 DATA AA,BD,5F,C3,91,D1,A5,6E,91,F3   NN
2520 DATA C8,C6,6D,F0,02,D0,C2,A6,6C,E0   FF
2530 DATA 06,F0,0C,E8,E8,86,6C,98,18,69   HK
2540 DATA 24,A8,4C,8B,C2,C6,D7,F0,11,98   MD
2550 DATA 38,E9,78,85,BE,A5,6E,A6,6F,85   FM
2560 DATA 6F,86,6E,4C,57,C1,AD,0E,DC,09   CP
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
•2570 DATA 01,8D,0E,DC,60,85,FF,18,A5,D1  OH
•2580 DATA 65,FF,85,D1,90,03,E6,D2,18,A5  LG
•2590 DATA F3,65,FF,85,F3,90,02,E6,F4,B8  ID
•2600 DATA 60,85,FF,38,A5,D1,E5,FF,85,D1  JK
•2610 DATA B0,03,C6,D2,38,A5,F3,E5,FF,85  EC
•2620 DATA F3,B0,02,C6,F4,B8,60,A2,0F,DD  EG
•2630 DATA DA,E8,D0,13,8A,A6,70,F0,09,95  CP
•2640 DATA 6D,8A,0A,29,03,85,70,60,85,6E  NJ
•2650 DATA 85,6F,60,CA,10,E5,60,00,20,40  FN
•2660 DATA 60,80,A0,C0,FF,80,00,40,20,40  AB
•2670 DATA C0,80,A1,20,6C,7B,62,7C,E1,FF  NO
•2680 DATA FE,7E,7F,61,FC,E2,FB,EC,A0,D5  CM
•2690 DATA 55,C9,49,CC,D2,CF,4F,C3,40,00  HN
•2700 DATA 20,00,10,08,04,00,00,E7,A7,E7  NC
•2710 DATA C7,97,8F,FF,FB,00  GN
```

MORE BASIC PROGRAMMING

FROM PAGE 79

ALCHEMIST'S APPRENTICE

```
•900 PRINT "[CLEAR]  FH
•910 PRINT "[10" "]ALCHEMIST'S APPRENTICE
"  JF
•920 PRINT "[17" "]COPYRIGHT"  JL
•930 PRINT "[12" "]CHERYL COX PETERSON"  FL
•940 PRINT "[19" "]1986"  NP
•950 PRINT:PRINT:PRINT:PRINT  BN
•960 INPUT"DO YOU NEED INSTRUCTIONS";X$  AI
•970 IF X$="N" THEN GOTO 1500  LL
•980 PRINT"[CLEAR]"  HH
•990 I=1  CJ
•1000 PRINT"THE GAME'S OBJECTIVE IS TO CR
EATE"  HB
•1005 PRINT"AND HIDE AS MUCH GOLD AS YOU
CAN"  AB
•1010 PRINT"BEFORE YOUR MASTER, THE ALCHE
MIST"  BJ
•1015 PRINT"RETURNS FROM THE ALCHEMIST'S"  GI
•1020 PRINT"ASSOCIATION'S ANNUAL CONVENTI
ON."  KE
•1030 PRINT"THE BOSS MAY CALL TO LET YOU"  EH
•1035 PRINT"KNOW WHEN HE'S RETURNING."  KJ
•1040 PRINT"THEN AGAIN, HE MAY NOT. IF YO
U"  CA
•1045 PRINT"DON'T HAVE THE SHOP CLEANED"  FE
•1050 PRINT"BEFORE HE RETURNS, YOU'LL GET
 A BEATING."  JP
•1060 GOSUB 10100  JF
•1065 PRINT"[CLEAR]"  HH
•1070 PRINT"THERE ARE DANGERS INVOLVED."  BP
•1075 PRINT"THOUGH YOU'VE LEARNED MUCH, E
VEN SLIGHT"  CC
•1080 PRINT"CHANGES IN INCANTATIONS OR IN
GREDIENTS"  HH
•1085 PRINT"CAN CAUSE UNPREDICTABLE RESUL
TS."  EN
•1100 PRINT"ONCE YOU HAVE THE RIGHT COMBI
NATION"  LP
•1103 PRINT "OF INCANTATIONS AND INGREDIE
NTS,"  MD
•1105 PRINT"IT CAN ONLY CHANGE 10 STONES
AT A TIME."  LG
•1200 PRINT"YOU MAY USE UP YOUR INGREDIEN
TS"  PG
•1203 PRINT"AND HAVE TO FETCH MORE."  IM
•1205 PRINT"EVEN THE WEATHER CAN CHANGE A
 SPELL'S"  FP
•1208 PRINT"EFFECTIVENESS."  NB
•1210 PRINT"IF THE ALCHEMIST RETURNS BEFO
RE YOU GET YOUR GOLD HIDDEN"  LD
•1220 PRINT"YOU LOSE YOUR GOLD AND GET WH
IPPED."  LP
•1230 PRINT"[14" "][RVSON]GOOD LUCK[RVSOF
F]."  PG
•1300 GOSUB 10100  JF
•1500 REM SETUP  EE
•1550 PRINT"[CLEAR]"  HH
•1560 DIM A(17), M1(17), M2(9), WT(10), R
(11), RC(10)  CD
•1570 I=0  CK
•1900 CS=0:SB=0:Y=0:TL=0:G=0  AD
•1910 PRINT"[CLEAR]"  HH
•2000 REM MAIN ROUTINE  CC
•2002 IF TL>0 THEN 2010  PD
•2005 T=INT(RND(1)*10+1)  DJ
•2010 R=INT(RND(1)*10+1)  DH
•2015 IF TL>0 THEN TL=TL+1  PI
•2045 REM PRINT"[CLEAR]"  CA
•2050 ON R GOSUB 4000,4500,5000,6000,7000
,7000,8000,8000,9000,6000,4000  NH
•3000 REM CLOCK ROUTINE  EE
•3005 IF T<>1 THEN 2000  FG
•3006 IF TL=0 THEN TL=1  LC
•3010 IF TL=60 THEN GOTO 3500  LK
•3020 IF TL<>45 THEN 3030  NL
•3025 PRINT"THE ALCHEMIST WILL RETURN IN
15 MINUTES.  JF
•3030 IF TL<>30 THEN 3040  IP
•3035 PRINT"THE ALCHEMIST WILL RETURN IN
30 MINUTES."  CO
•3040 IF TL<>15 THEN 3050  HL
•3045 PRINT"THE ALCHEMIST WILL RETURN IN
45 MINUTES"  GH
•3050 GOTO 2000  EP
•3500 RC=INT(RND(1)*15+1)  HI
•3501 PRINT"GAME OVER"  HL
•3510 GOTO 20000  HL
•4000 REM FOUND IT SUBROUTINE  OC
•4020 IF Y=1 THEN RETURN  AC
•4030 PRINT"HEY WOW YOU FOUND IT!"  KJ
•4032 PRINT"THAT'S 10 PIECES OF GOLD."  AO
•4034 IF TL>0 THEN TL=TL+1  IM
•4040 G=G+10  FF
```

```
•4050 GOSUB 10010                          IN
•4100 RC=INT(RND(1)*15+1)                  HI
•4110 IF RC>14 THEN GOSUB 20500            FP
•4120 IF RC>11 THEN GOTO 4200              DO
•4130 G=G+10:PRINT"YOU CHANGED ANOTHER 10
 STONES."                                  DO
•4140 PRINT "YOU NOW HAVE ";G; "GOLD NUGG
ETS.":GOSUB 10010                          MN
•4150 GOTO 4100                            FO
•4200 PRINT "THE WEATHER CHANGED AND"      LG
•4210 PRINT "YOUR SPELL NO LONGER WORKS.
TOO BAD."                                  EK
•4220 GOSUB 10010                          IN
•4499 RETURN                               IM
•4500 REM PARTLY SUCCESSFUL SUBROUTINE     GG
•4600 G1=INT(RND(1)*6+1)                   DI
•4610 PRINT"CONGRATULATIONS! YOU MANAGED
TO"                                        KA
•4620 PRINT"CHANGE ";G1; "OF THE STONES I
NTO GOLD.":G=G+G1:GOSUB 10010              LP
•4625 TL=TL+1                              OO
•4630 PRINT"DO YOU WANT TO USE THE [RVSON
]S[RVSOFF]AME SPELL"                       BO
•4640 INPUT"OR TRY SOMETHING [RVSON]D[RVS
OFF]IFFERENT";X$                           OP
•4645 PRINT"[CLEAR]"                       HH
•4650 IF X$="D" THEN RETURN                HI
•4660 IF X$<>"S" THEN 4630                 GO
•4700 Y=INT(RND(1)*15+1)                   IB
•4710 IF Y>14 THEN GOTO 5000               PG
•4720 IF Y<13 THEN 4800                    HE
•4740 PRINT"TOO BAD. THE WEATHER CHANGED,
 SO YOUR"                                  KL
•4750 PRINT"SPELL ISN'T WORKING ANY MORE.
"                                          ML
•4760 Y=1                                  DJ
•4780 GOSUB 10010                          IN
•4790 RETURN                               IM
•4800 PRINT"YOU'VE TURNED ";G1;" MORE OF
THE STONES TO GOLD.":G=G+G1                AK
•4810 TL=TL+1:GOSUB 10010                  LC
•4820 GOTO 4630                            FI
•5000 REM EARLY SUBROUTINE                 BJ
•5010 IF TL<20 THEN RETURN                 IC
•5100 GOTO 20510                           IJ
•6000 REM COUNTERSPELL ROUTINE             IA
•6010 IF CS=1 THEN RETURN                  DC
•6100 PRINT"YOU STUMBLE ACROSS A COUNTERS
PELL"                                      CL
•6110 PRINT"THAT REVERSES THE LAST SPELL
MADE."                                     HA
•6120 PRINT"IT MUST BE REPEATED EXACTLY A
S WRITTEN"                                 EH
•6130 PRINT"IN THE BOOK IN ORDER TO WORK.
"                                          JC
•6140 PRINT"YOU MEMORIZE IT!":CS=1         PD
•6150 GOSUB 10010                          IN
•6999 RETURN                               IM
•7000 REM WASTED TIME SUBROUTINE           IE
•7010 WT=INT(RND(1)*9+1):IF Y=3 THEN RETU
RN                                         NK
•7020 ON WT GOSUB 7100,7200,7300,7400,750
0,7600,7700,7800,7900,7960                 MP
•7030 GOSUB 10010                          IN
•7040 RETURN                               IM
•7100 IF SB=1 THEN RETURN                  EL
•7110 PRINT"YOU FOUND THE ALCHEMIST'S SPE
LL BOOK,"                                  HG
•7120 PRINT"BUT THE SPELL YOU WANT ISN'T
IN IT."                                    OG
•7130 PRINT"YOU WASTED 20 MINUTES LOOKING
 FOR IT!"                                  DJ
•7135 PRINT"TOUGH LUCK!"                   OM
•7140 IF TL>40 THEN GOSUB 20010            IB
•7150 TL=TL+20:SB=1:RETURN                 LJ
•7200 PRINT"YOU CAN'T SEEM TO FIND THAT"   OF
•7210 PRINT"INGREDIENT YOU WANT."          IG
•7220 PRINT"YOU WASTE 6 MINUTES LOOKING F
OR IT."                                    KO
•7250 TL=TL+6:RETURN                       KA
•7300 PRINT"A FRIEND CALLS YOU UP. YOU WA
STE 10"                                    BI
•7310 PRINT"MINUTES TRYING TO GET RID OF
HIM."                                      GH
•7320 TL=TL+10                             BG
•7350 TL=TL+10:RETURN                      OD
•7400 PRINT"DELIVERY MAN BRINGS SUPPLIES.
"                                          AH
•7410 PRINT"YOU WASTE 7 MINUTES CHECKING
CONTENTS"                                  MG
•7420 PRINT"AND SIGNING FOR IT."           AA
•7450 TL=TL+7:RETURN                       KB
•7500 PRINT"YOU MISPLACED THE MORTAR AND
PESTLE,"                                   CG
•7510 PRINT"AND YOU NEED TO GRIND SOME IN
GREDIENTS."                                OO
•7520 PRINT"YOU SPEND 3 MINUTES LOCATING
THEM."                                     OO
•7550 TL=TL+3:RETURN                       KF
•7600 PRINT"THERE'S NEVER A LIGHTER WHEN
YOU"                                       JA
•7610 PRINT"NEED ONE. YOU SPEND 2 MINUTES
 LOOKING."                                 EM
•7650 TL=TL+2:RETURN                       LE
•7700 PRINT"EVERYTHING IS SO CONFUSING."   GL
•7710 PRINT"TAKE A MINUTE TO STOP AND THI
NK."                                       JI
•7750 TL=TL+1:RETURN                       LL
•7800 PRINT"YOU REMEMBER SOMETHING THE AL
CHEMIST"                                   BD
•7810 PRINT"WANTED YOU TO DO."             EP
•7820 PRINT"YOU TAKE 5 MINUTES TO DO IT."  FP
•7850 TL=TL+5:RETURN                       KH
•7900 PRINT"YOU NEED SOME MORE DISTILLED
WATER."                                    LH
•7910 PRINT"YOU SPEND 4 MINUTES SETTING I
T UP."                                     BN
•7950 TL=TL+4:RETURN                       KG
```

```
·7960 PRINT"YOU'LL NEED MORE STONES SOON.
"                                          EE
·7970 PRINT"COLLECTING MORE TAKES YOU 8 M
INUTES."                                   MA
·7980 TL=TL+8:RETURN                       LC
·7999 RETURN                               IM
·8000 REM MONSTER SUBROUTINE               OD
·8010 M1=INT(RND(1)*9+1)                   GL
·8100 PRINT"OH NO! YOU CREATED A ";        EF
·8200 ON M1 GOSUB 8310,8320,8330,8340,835
0,8360,8370,8380,8390                      EB
·8300 GOTO 8400                            FN
·8310 PRINT"SMALL DRAGON ":RETURN          PN
·8320 PRINT"CHIMERA ":RETURN               MF
·8330 PRINT"HYDRA ":RETURN                 EF
·8340 PRINT"LION ":RETURN                  PA
·8350 PRINT"BEAR ":RETURN                  PM
·8360 PRINT"TIGER ":RETURN                 GM
·8370 PRINT"HARPY ":RETURN                 EB
·8380 PRINT"WOLF ":RETURN                  BI
·8390 PRINT"ALLIGATOR":RETURN              HI
·8400 PRINT"AND IT LOOKS HUNGRY!"          PA
·8410 PRINT"DO SOMETHING QUICK!"           FJ
·8415 GOSUB 10100                          IN
·8420 IF CS=0 GOTO 8600                    FI
·8430 PRINT"USE THE COUNTERSPELL."         II
·8435 GOSUB 10100                          IN
·8440 GOSUB 10010                          IN
·8450 RETURN                               IM
·8600 M2=INT(RND(1)*09+1)                  GB
·8610 ON M2 GOSUB 8650,8700,8750,8700,885
0,8700,8750,8700,8650,8800                 BC
·8620 RETURN                               IM
·8650 PRINT"OH NO! YOU MADE ANOTHER ONE!"  EK
·8660 PRINT"YOU'D BETTER TRY AGAIN."       DF
·8663 GOSUB 10100                          IN
·8665 TL=TL+1                              OO
·8670 GOTO 8600                            FP
·8675 TL=TL+1:GOTO 8600                    JC
·8700 PRINT"WOULD YOU BE MORE CAREFUL?"    BO
·8710 GOSUB 10010                          IN
·8720 RETURN                               IM
·8750 PRINT"THAT DIDN'T WORK. THE SITUATI
ON'S"                                      LP
·8760 PRINT"GETTING DESPERATE. HURRY!"     AB
·8765 GOSUB 10100                          IN
·8800 PRINT"WHAT ARE YOU DOING? TURNING Y
OURSELF "                                  KL
·8810 PRINT"INTO A CHICKEN WON'T HELP!"    LH
·8820 PRINT"CHANGE BACK AND TRY AGAIN."    JE
·8825 GOSUB 10100                          IN
·8830 TL=TL+1:GOTO 8600                    JC
·8850 PRINT"TOO LATE. AT LEAST YOU WERE T
ASTY."                                     GG
·8855 PRINT"YOU HAD ";G;" GOLD PIECES WHE
N YOU DIED."                               OC
·8860 GOTO 10070                           IP
·8999 RETURN                               IM
·9000 REM ANIMAL SUBROUTINE                DH
·9100 A=INT(RND(1)*12+1)                   DE
·9200 PRINT"YOU'VE CHANGED YOURSELF INTO
A ";                                       PD
·9210 ONAGOSUB 9310,9320,9340,9350,9360,9
370,9380,9390,9400,9410,9420,9430,9440     GN
·9290 GOTO 9500                            FP
·9310 PRINT"DOG. ":RETURN                  NG
·9320 PRINT"PIG. ":RETURN                  OM
·9330 PRINT"CAT. ":RETURN                  MO
·9340 PRINT"TURKEY. ":RETURN               NG
·9350 PRINT"FOX. ":RETURN                  NF
·9360 PRINT"COW. ":RETURN                  NH
·9370 PRINT"DUCK. ":RETURN                 DO
·9380 PRINT"GOAT. ":RETURN                 DK
·9390 PRINT"FROG. ":RETURN                 CF
·9400 PRINT"LIZARD. ":RETURN               NO
·9410 PRINT"NEWT":RETURN                   OP
·9420 PRINT"SNAKE. ":RETURN                IP
·9430 PRINT"TURTLE. ":RETURN               OK
·9440 PRINT"GOLDFISH. ":RETURN             FD
·9500 IF A>12 THEN GOTO 9900               PF
·9510 IF A>7 THEN GOTO 9700                LE
·9600 PRINT"EVEN IF YOU KNOW THE COUNTERS
PELL, "                                    PF
·9610 PRINT"YOU CAN'T USE IT. TRY SWISHIN
G"                                         CB
·9620 PRINT"YOUR TAIL OR SOMETHING."       DK
·9630 GOSUB 10100                          IN
·9650 F=INT(RND(1)*2+1)                    AC
·9660 IF F=2 THEN GOTO 9685                LL
·9670 PRINT"THAT DID IT!"                  PN
·9675 GOSUB 10010                          IN
·9680 RETURN                               IM
·9685 PRINT"THAT DIDN'T WORK. TRY AGAIN."  EH
·9690 GOSUB 10100                          IN
·9695 TL=TL+1:GOTO 9650                    KK
·9700 PRINT"WHAT A PREDICAMENT! TRY FLICK
ING "                                      IA
·9710 PRINT"YOUR TONGUE OR WIGGLING SOMET
HING."                                     CP
·9715 GOSUB 10100                          IN
·9720 F=INT(RND(1)*2+1)                    AC
·9730 IF F=1 THEN GOSUB 9980               NK
·9740 IF F=1 THEN GOTO 9720                LO
·9750 PRINT"THAT'S AN IMPROVEMENT. AT LEA
ST, "                                      BJ
·9760 PRINT"YOU'RE WARM-BLOODED."          OF
·9765 GOSUB 10100                          IN
·9770 A=INT(RND(1)-5+12)                   DH
·9780 GOTO 9200                            FM
·9900 PRINT"YOU ARE SUPPOSED TO MAKE [RVS
ON]GOLD[RVSOFF], NOT"                      IH
·9910 PRINT"TURN YOURSELF INTO A [RVSON]G
OLD[RVSOFF]FISH."                          EC
·9920 PRINT"START BLOWING BUBBLES. MAYBE
YOU'LL"                                    NM
·9930 PRINT"STUMBLE ACROSS THE RIGHT PATT
ERN."                                      KC
·9935 GOSUB 10100                          IN
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•9940 F=INT(RND(1)*2+1)                       AC
•9945 IF F=1 THEN GOSUB 9980                  NK
•9950 PRINT"THAT'S A LITTLE BETTER."          BC
•9955 GOSUB 10100                             IN
•9970 GOTO 9700                               FJ
•9980 PRINT"THAT DIDN'T WORK. TRY AGAIN.
 "                                            MO
•9981 GOSUB 10100                             IN
•9985 TL=TL+1:RETURN                          LL
•9999 END                                     IC
•10010 PRINT"DO YOU WANT TO START CLEANIN
 G UP?"                                       BE
•10020 PRINT"THE ALCHEMIST COULD RETURN E
 ARLY."                                       CB
•10030 INPUT"[RVSON]Y[RVSOFF] OR [RVSON]N
 [RVSOFF]";X$                                 HD
•10050 IF X$<>"Y"THEN 10090                   LF
•10060 PRINT"CONGRATULATIONS, YOU'VE GOT
 ";G;" GOLD PIECES."                          EK
•10070 PRINT"WOULD YOU LIKE TO TRY AGAIN?
 "                                            FF
•10080 INPUT "[RVSON]Y[RVSOFF] OR [RVSON]
 N[RVSOFF]";D$                                EH
•10085 IF D$="Y"THEN 1900                     LO
•10089 END                                    IC
•10090 IF TL>20 THEN PRINT"[CLEAR]":RETUR
 N                                            CN
•10094 PRINT"[CLEAR]"                         HH
•10095 PRINT"OK, LET'S TRY IT AGAIN.":RET
 URN                                          OF
•10100 IF I=1 THEN GOTO 10110                 NN
•10105 PRINT"PRESS A KEY TO TRY SOMETHING
  ELSE.":GOTO 10200                           CK
•10110 PRINT:PRINT"PRESS A KEY TO CONTINU
 E"                                           GO
•10200 GET Q$                                 BL
•10300 IF Q$="" THEN 10200                    KN
•10400 IF Q$<>"" THEN PRINT"[CLEAR]"          LO
•10500 RETURN                                 IM
•20000 REM ALCHEMIST RETURNS                  DO
•20010 PRINT"TOO BAD. THE ALCHEMIST IS BA
 CK"                                          AJ
•20020 GOTO 20515                             IM
•20500 REM ALCHEMIST RETURNS EARLY            KD
•20510 PRINT"TOO BAD. THE ALCHEMIST RETUR
 NED EARLY"                                   JP
•20515 IF G<1 THEN GOTO 20525                 OD
•20520 PRINT"YOU LOSE ALL YOUR GOLD"          BB
•20525 PRINT"AND YOU GET A BEATING."          KE
•20530 PRINT"BETTER LUCK NEXT TIME."          MP
•20540 PRINT"CARE TO TRY AGAIN?"              JO
•20545 INPUT"[RVSON]Y[RVSOFF] OR [RVSON]N
 [RVSOFF]";D$                                 EH
•20550 IF D$="Y" THEN GOTO 1900               EI
•20560 IF D$="N" THEN 9999                    KP
•20570 GOTO 20540                             IA
```

C-128 GRAPHIC BIT MAP FROM PAGE 37

Note: codes listed alongside the five programs under this heading are for use with the C-128 Bug Repellent.

HI-RES BIT MAP DRAW & SAVE

```
•5 REM PLANETS HI RES GRAPHIC                     FC
•6 REM BY DOUG GANNON                             CO
•10 COLOR0,1:COLOR1,2:COLOR3,1:COLOR4,1           HE
•20 GRAPHIC1,1                                    GP
•30 FORS=1TO180                                   PF
•40 REM PLOT STARS                                FD
•50 SY=INT(RND(0)*159)                            PP
•60 SX=INT(RND(0)*319)                            AG
•70 DRAW1,SX,SY:NEXTS                             OF
•80 REM DRAW FORGROUND                            HD
•90 COLOR1,6                                      HN
•100 FORY=160TO199STEP3                           CJ
•110 DRAW1,160,160TO0,Y:NEXTY                     AE
•120 FORX=0TO319STEP10                            CL
•130 DRAW1,160,160TOX,199:NEXTX                   FI
•140 FORY=199TO160STEP-3                          PP
•150 DRAW1,319,YTO160,160:NEXTY                   JI
•160 REM DRAW NORTHERN LATITUDINAL LINES          AL
•170 COLOR1,10:R=32:XR=9+R                        BD
•180 FORY=30TO78STEP12                            BD
•190 CIRCLE1,158,Y,XR,5                           ND
•200 R=R/2:XR=XR+R:NEXTY                          HP
•210 REM DRAW SOUTHERN LATITUDINAL LINES          OF
•220 R=2:XR=71-R                                  DK
•230 FORY=90TO126STEP12                           DH
•240 CIRCLE1,158,Y,XR,5                           ND
•250 R=R*2:XR=XR-R:NEXTY                          GP
•260 REM DRAW LONGITUDINAL LINES                  IM
•270 R=2:XR=72-R:FORI=1TO8                        BF
•280 CIRCLE1,158,78,XR,62                         MD
•290 R=R+2:XR=XR-R:NEXTI                          JF
•300 REM DRAW STAR                                PJ
•310 COLOR1,7                                     HM
•320 CIRCLE1,40,30,20,18                          HB
•330 PAINT1,40,30,1                               IK
•400 REM HIGH RES BIT MAP SAVE ROUTINE            DP
•410 REM FOR THE COMMODORE 128                    KI
•430 REM BY MORTON A. KEVELSON                    NG
•440 REM HAVE SAVE DISK IN DRIVE                  JL
•450 REM WHEN RUNNING THIS PGM                    DB
•500 BANK15:A=PEEK(DEC("D020"))AND15              PI
•510 POKE8168,A                                   NC
•520 BSAVE"PLANETS.BMP",B0,P7168 TO P1619
 1                                                BA
•530 GRAPHIC0                                     AO
```

HI-RES BIT MAP LOAD

```
•10 REM HI RES LOADER FOR THE C128                GH
•20 REM BY MORTON A. KEVELSON                     NG
•100 GRAPHIC1                                     BB
```

```
·110 BANK0:BLOAD"PLANETS.BMP"                  DA
·120 A=(PEEK(8168))+1                          AP
·130 COLOR4,A                                  IN
```

MULTICOLOR BIT MAP DRAW & SAVE

```
·5 REM MICKEY MOUSE                            NH
·6 REM MULTICOLOR DEMO FOR THE C128            PM
·7 REM BY DOUG GANNON                          CO
·10 COLOR0,2:COLOR1,1:COLOR2,8:COLOR3,3:C
 OLOR4,2                                       HI
·20 GRAPHIC3,1                                 HB
·30 CIRCLE1,38,33,22,33                        GI
·40 CIRCLE1,122,33,22,33                       IB
·50 CIRCLE1,80,109,41,70,250,110               AH
·60 CIRCLE1,68,152,32,35,183,334               DF
·70 CIRCLE1,92,152,32,35,26,177                FC
·80 CIRCLE1,80,170,18,28,105,255               HH
·90 CIRCLE1,68,96,8,24                         DE
·100 CIRCLE1,92,96,8,24                        GH
·110 CIRCLE1,68,105,4,12                       GG
·120 CIRCLE1,92,105,4,12                       HP
·130 CIRCLE1,66,80,9,20,270,25                 FH
·140 CIRCLE1,94,80,9,20,335,90                 LG
·150 CIRCLE1,58,92,10,34,213,340               EI
·160 CIRCLE1,102,92,10,34,20,147               EL
·170 CIRCLE1,65,80,15,29,310,80                KL
·180 CIRCLE1,95,80,15,29,280,50                BF
·190 CIRCLE1,80,109,30,55,118,242              DD
·200 CIRCLE1,60,152,12,20,290,358              PK
·210 CIRCLE1,100,152,12,18,2,70                AJ
·220 CIRCLE1,80,160,35,38,332,28               NB
·230 CIRCLE1,80,160,13,22,90,270               LO
·240 CIRCLE1,76,178,8,9,310,70                 KJ
·250 CIRCLE1,86,178,8,9,325,35                 PB
·260 CIRCLE1,80,137,12,12                      JL
·270 CIRCLE1,79,134,6,4                        GN
·280 CIRCLE1,30,187,30,20,90,200               EE
·290 CIRCLE1,130,187,30,20,140,270             MP
·300 CIRCLE1,32,200,37,40,75,90                AP
·310 CIRCLE1,128,200,37,40,270,285             HP
·320 PAINT1,77,199                             JB
·330 PAINT1,42,109                             IK
·340 PAINT1,80,147                             HG
·350 PAINT1,80,165                             HG
·360 PAINT3,65,198,1                           NN
·370 PAINT3,95,198,1                           PI
·380 PAINT3,80,175,1                           OJ
·390 PAINT1,40,33                              CP
·400 PAINT1,120,33                             GD
·410 PAINT1,68,105                             IG
·420 PAINT1,92,105                             HN
·430 PAINT2,70,152,1                           MI
·500 REM MULTICOLOR BIT MAP SAVE               GJ
·510 REM FOR THE C128                          DA
·520 REM BY MORTON A. KEVELSON                 NG
·530 BANK15:A=PEEK(DEC("D020")) AND 15         PI
·540 B=PEEK(DEC("D021")) AND 15                IP
·550 BANK0:POKE8168,A                          EJ
·560 POKE8169,B                                OG
·570 BSAVE"MMOUSE.BMP",B0,P7168 TO P16383      EL
·580 BANK15                                    GM
·590 POKE(DEC("D01A")),PEEK(DEC("D01A"))A
 ND254                                         HN
·600 POKE1,PEEK(1)AND254                       IJ
·610 BSAVE"MMOUSE.CMM",B15,P55296 TO P563
 19                                            HA
·620 POKE1,PEEK(1) OR 1                        BH
·630 POKE(DEC("D01A")),PEEK(DEC("D01A"))
 OR 1                                          AP
·640 GRAPHIC 0                                 AO
```

MULTICOLOR BIT MAP LOAD

```
·1 REM MULTICOLOR BIT MAP LOADER               OM
·2 REM FOR THE COMMODORE C128                  KD
·3 REM BY MORTON A. KEVELSON                   NG
·10 GRAPHIC3,1                                 HB
·20 BLOAD"MMOUSE.BMP",B0,P7168                 FI
·30 BANK15                                     GM
·40 POKE(DEC("D01A")),PEEK(DEC("D01A")) A
 ND 254                                        HN
·50 POKE1,PEEK(1) AND 254                      IJ
·60 BLOAD"MMOUSE.CMM",B15,P55296               LK
·65 POKE1,PEEK(1) OR 1                         BH
·70 POKE(DEC("D01A")),PEEK(DEC("D01A")) O
 R 1                                           AP
·80 BANK15:A=(PEEK(8168)AND15)+1               IJ
·90 B=(PEEK(8169)AND15)+1                      EB
·100 COLOR0,B:COLOR4,A                         FF
```

KOALA TO C-128 CONVERTOR

```
·10 REM KOALA TO MULTICOLOR BIT MAP            GI
·20 REM CONVERTER FOR THE C128                 CM
·30 REM BY MORTON A. KEVELSON                  NG
·40 REM PUT FILE TO BE CONVERTED ON SAVE
 DISK                                          PK
·50 BLOAD"?PIC A*",B1,P24576                   HE
·60 REM USE YOUR FILE NAME IN LINE 50          BL
·70 BANK 1                                     DD
·80 FOR VM =0 TO 999                           EN
·90 POKE 23552+VM,PEEK(32576+VM)               IC
·100 NEXT VM                                   CO
·110 POKE 24554,(PEEK(34576)AND15)             IM
·120 BSAVE"PIC A.BMP",B1,P23552 TO P32575      CG
·130 BSAVE"PIC A.CMM",B1,P33576 TO P34575      AF
```

FREE RAM CHECK
FROM PAGE 35

```
·10 REM *** FREE RAM CHECK *** BUCK CHILD
 RESS (01/27/86) ***                           PM
·20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                         DC
·30 POKE56,PEEK(56)-4:CLR                      HP
·40 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA[3"."]":PRINT:J=40000:L=100:C=11           LI
·50 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB
```

```
:READA                                     FE
•60 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
END                                        MC
•70 X=0:J=J+12:L=L+10:IFL<260THEN50        AN
•80 IFL=260THENC=7:GOTO50                  DI
•90 PRINT"DATA OK AND LOADED[3"."]":PRINT
:PRINT"SYS 4[4"0"] TO ACTIVATE[3"."]":EN
D                                          GH
•100 DATA32,68,229,169,167,162,2,133,251,
134,252,134,1733                           HA
•110 DATA253,162,0,142,219,216,232,32,186
,156,230,253,2081                          JH
•120 DATA162,0,160,0,138,141,219,4,145,25
1,209,251,1680                             PC
•130 DATA208,66,232,208,243,230,251,208,2
39,230,252,165,2532                        KD
•140 DATA252,197,253,144,231,201,208,176,
37,32,158,156,2045                         HK
•150 DATA165,253,201,4,176,12,169,60,133,
251,162,2,1588                             PM
•160 DATA32,186,156,76,86,156,169,192,162
,207,133,252,1807                          OC
•170 DATA134,253,162,3,32,186,156,76,86,1
56,160,13,1417                             BP
•180 DATA32,194,156,160,30,76,194,156,160
,20,32,194,1404                            JF
•190 DATA156,165,253,201,208,176,240,169,
0,133,251,76,2028                          DE
•200 DATA124,156,160,6,24,32,240,255,160,
0,185,230,1572                             DG
•210 DATA156,240,7,32,210,255,200,76,194,
156,192,13,1731                            BE
•220 DATA144,1,96,166,251,165,252,32,205,
189,169,45,1715                            AK
•230 DATA32,210,255,162,255,165,253,76,20
5,189,67,72,1941                           GN
•240 DATA69,67,75,73,78,71,32,42,42,32,0,
32,613                                     BM
•250 DATA42,42,32,79,75,0,32,42,42,32,69,
82,569                                     DI
•260 DATA82,79,82,0,17,17,17,0,294         HM
```

FAILSAFE
FROM PAGE 56

```
•10 REM *** FAILSAFE *** BUCK CHILDRESS (
01/18/86) ***                              BD
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
9 ***                                      DC
•30 PRINTCHR$(147)"LOADING AND CHECKING D
ATA[3"."]":PRINT:J=49152:L=90:C=11         MB
•40 FORB=0TOC:READA:POKEJ+B,A:X=X+A:NEXTB
:READA                                     FE
•50 IFX<>ATHENPRINT"ERROR IN DATA LINE"L:
END                                        MC
•60 X=0:J=J+12:L=L+10:IFL<460THEN40        AI
•70 IFL=460THENC=4:GOTO40                  CA
•80 PRINT"DATA OK AND LOADED[3"."]":PRINT
:PRINT"SYS 49152 TO ACTIVATE[3"."]":END    MM
•90 DATA173,3,3,201,192,208,8,160,0,32,25
4,192,1426                                 EA
•100 DATA76,104,193,169,14,141,32,208,160
,6,32,254,1389                             ND
•110 DATA192,32,159,255,32,228,255,201,68
,208,7,162,1799                            CA
•120 DATA8,160,27,76,50,192,201,84,208,23
5,162,1,1404                               OL
•130 DATA160,34,142,199,193,32,254,192,16
0,41,32,254,1693                           PF
•140 DATA192,169,48,162,58,160,0,132,253,
160,2,132,1468                             OD
•150 DATA254,32,10,193,160,59,32,254,192,
169,65,162,1582                            OP
•160 DATA91,160,16,132,254,32,10,193,165,
253,141,194,1641                           PD
•170 DATA193,32,88,193,169,111,162,192,14
1,2,3,142,1428                             IK
•180 DATA3,3,96,173,32,208,41,15,201,12,2
40,27,1051                                 NC
•190 DATA141,191,193,173,197,193,208,9,16
5,161,201,212,2044                         OE
•200 DATA144,36,141,197,193,166,215,224,1
3,208,27,202,1766                          AH
•210 DATA142,32,208,162,0,160,0,32,225,25
5,240,11,1467                              OL
•220 DATA232,208,248,200,208,245,132,198,
76,173,192,32,2144                         MO
•230 DATA78,193,76,131,164,173,192,193,20
8,188,162,24,1782                          DO
•240 DATA160,0,24,32,240,255,169,17,32,21
0,255,174,1568                             JI
•250 DATA199,193,160,0,32,186,255,173,194
,193,162,208,1955                          MH
•260 DATA160,193,32,189,255,169,43,166,45
,164,46,32,1494                            PK
•270 DATA216,255,160,1,185,208,193,170,23
2,138,153,208,2119                         EJ
•280 DATA193,201,58,144,8,169,48,153,208,
193,136,16,1527                            HA
•290 DATA235,32,78,193,169,118,160,163,32
,30,171,76,1457                            JN
•300 DATA131,164,185,118,193,240,40,32,21
0,255,200,76,1844                          MC
•310 DATA254,192,133,251,134,252,169,0,13
3,198,32,159,1907                          PE
•320 DATA255,32,228,255,240,244,197,197,2
40,240,201,13,2342                         ND
•330 DATA208,10,164,253,192,2,144,230,32,
210,255,96,1796                            CG
•340 DATA201,20,208,5,104,104,76,15,192,1
97,251,144,1517                            EF
•350 DATA213,197,252,176,209,164,253,196,
254,176,203,153,2446                       MI
•360 DATA208,193,32,210,255,230,253,76,14
,193,173,191,2028                          MO
```

```
•370 DATA193,141,32,208,32,88,193,96,169,
0,170,168,1490                            PC
•380 DATA32,219,255,133,198,141,192,193,1
41,197,193,96,1990                        GF
•390 DATA169,131,162,164,141,2,3,142,3,3,
142,192,1254                              JH
•400 DATA193,96,13,79,70,70,13,0,147,13,1
8,68,780                                  LF
•410 DATA146,73,83,75,32,79,82,32,18,84,1
46,65,915                                 LJ
•420 DATA80,69,63,32,0,68,73,83,75,13,17,
0,573                                     CM
•430 DATA84,65,80,69,13,17,0,83,84,65,82,
84,726                                    JF
•440 DATA73,78,71,32,78,85,77,66,69,82,63
,32,806                                   HH
•450 DATA0,17,69,78,84,69,82,32,78,65,77,
69,720                                    PG
•460 DATA58,32,0,14,14,118                MF
```

THE GREAT ESCAPE
FROM PAGE 18

C-128 STARTUP

```
•1 REM                                    JD
•2 REM    RUPERT REPORT #29               PA
•3 REM      C-128 STARTUP                 OH
•4 REM         ROUTINE                    MA
•5 REM                                    JD
•10 EE$=CHR$(27)+"I" : CR$=CHR$(13)       GK
•11 KEY 1,CHR$(29)+CHR$(20)   :REM DELETE
 CHARACTER AT CURSOR                      HA
•12 KEY 2,EE$+"DLOAD"+CHR$(34)            MF
•13 KEY 3,EE$+"DIRECTORY"+CR$             FG
•14 KEY 4,EE$+"CLOSE[3"2"]:OPEN[3"2"],4:C
MD[3"2"]:LIST"+CR$+"PRINT#[3"2"]:CLOSE[3
"2"]"+CR$                                 JM
•15 KEY 5,EE$+"DSAVE"+CHR$(34)            NL
•16 KEY 6,EE$+"RUN"+CR$                   EG
•17 KEY 7,EE$+"LIST"+CR$                  MH
•18 KEY 8,EE$+"MONITOR"+CR$               IL
•20 COLOR 0,1:COLOR 4,16:COLOR 1,2:COLOR
5,2:COLOR 6,1                             EI
•30 KEY : NEW                             NA
```

STAR SEARCH
FROM PAGE 54

STAR SEARCH BOOT

```
•10 PRINT"[CLEAR]LOADING ML"              CC
•20 CK=0:ML=49152:FORI=MLTOML+525:READDA:
CK=CK+DA:POKEI,DA:NEXT                    HF
•30 IFCK<>74243THENPRINT"ERROR IN ML DATA
 LINES":END                               JE
•40 POKE198,4                             KF
•50 PRINT"[CLEAR][DOWN][DOWN]LOAD"CHR$(34
)"STAR SEARCH";                           JB
•60 PRINTCHR$(34)",8[HOME]";              PI
•70 POKE631,13:POKE632,82:POKE633,117:POK
E634,13                                   IA
•80 END                                   IC
•90 DATA 174,122,193,234,234,234,169,0,14
1,236,194,32                              AK
•100 DATA 179,193,188,122,193,140,129,193
,174,126,193,232                          GO
•110 DATA 202,32,37,193,172,129,193,173,1
27,193,201,2                              FO
•120 DATA 208,10,169,32,72,173,33,208,72,
76,54,192                                 KI
•130 DATA 177,251,72,177,253,72,204,124,1
93,240,20,200                             BD
•140 DATA 177,251,72,177,253,136,145,253,
104,145,251,200                           LA
•150 DATA 204,124,193,208,238,240,18,136,
177,251,72,177                            MO
•160 DATA 253,200,145,253,104,145,251,136
,204,123,193,208                          BE
•170 DATA 238,173,127,193,201,0,208,5,104
,104,76,115                               EL
•180 DATA 192,104,145,253,104,145,251,236
,125,193,208,160                          MD
•190 DATA 96,234,234,172,124,193,200,189,
122,193,170,32                            KN
•200 DATA 37,193,173,128,193,201,2,208,19
,136,169,32                               JA
•210 DATA 153,130,193,173,33,208,153,182,
193,204,123,193                           PP
•220 DATA 208,239,240,16,136,177,251,153,
130,193,177,253                           MH
•230 DATA 153,182,193,204,123,193,208,240
,236,125,193,240                          PG
•240 DATA 37,202,32,37,193,172,124,193,20
0,136,177,251                             HI
•250 DATA 72,177,253,32,55,193,145,253,10
4,145,251,32                              AI
•260 DATA 63,193,204,123,193,208,234,236,
125,193,208,221                           MP
•270 DATA 240,46,202,206,126,193,232,32,3
7,193,172,124                             DN
•280 DATA 193,200,136,32,55,193,177,251,7
2,177,253,32                              PB
•290 DATA 63,193,145,253,104,145,251,204,
123,193,208,234                           IB
•300 DATA 236,126,193,208,221,238,126,193
,232,32,37,193                            ON
•310 DATA 173,128,193,201,0,240,20,172,12
3,193,136,200                             BO
•320 DATA 185,182,193,145,253,185,130,193
,145,251,204,124                          BC
•330 DATA 193,208,240,96,234,189,96,193,1
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
 33,252,24,105                              HI
•340 DATA 212,133,254,189,71,193,133,251,
 133,253,96,72                              KH
•350 DATA 152,24,105,40,168,104,96,72,152
 ,56,233,40                                 HI
•360 DATA 168,104,96,0,40,80,120,160,200,
 240,24,64                                  DA
•370 DATA 104,144,184,224,8,48,88,128,168
 ,208,248,32                                PM
•380 DATA 72,112,152,192,4,4,4,4,4,4,4,5    OO
•390 DATA 5,5,5,5,5,6,6,6,6,6,6,6           JJ
•400 DATA 7,7,7,7,7,1,5,34,0,24,1,4         AK
•410 DATA 5,0,120,173,21,3,201,234,208,13
 ,169,0                                     NA
•420 DATA 141,20,3,169,192,141,21,3,76,16
 1,193,169                                  NO
•430 DATA 49,141,20,3,169,234,141,21,3,88
 ,96,173                                    AH
•440 DATA 236,194,201,50,240,6,238,236,19
 4,96,234,234                               MK
•450 DATA 76,6,192,24,160,0,185,0,208,121
 ,81,195                                    JG
•460 DATA 153,0,208,200,200,192,4,208,241
 ,173,0,208                                 PI
•470 DATA 201,55,208,3,32,242,193,56,160,
 0,185,4                                    OI
•480 DATA 208,249,85,195,153,4,208,200,20
 0,192,8,208                                GM
•490 DATA 241,162,20,160,0,200,208,253,20
 2,208,250,234                              EE
•500 DATA 234,234,234,234,234,96,160,0,14
 0,80,195,32                                HC
•510 DATA 151,224,165,141,41,3,172,80,195
 ,153,81,195                                CL
•520 DATA 200,200,140,80,195,192,12,208,2
 34,96                                      FC
```

STAR SEARCH

```
•10 PRINT"[CLEAR]"                          HH
•20 CLR:POKE56,48:POKE52,48:DIMVS(11)       OH
•30 GOSUB620:AG=0:TR=0:TI$="[6"0"]"         CH
•40 W=49152:BD=53280:PS=53281               FI
•50 V=53248: X=100:Y=189:Y1=178:X1=55:RT=
 6:DT=70:SR=49576:POKEPS,0                  KG
•60 POKEBD,0: H=0:SD=42:L=20:H=0:MS=0       LI
•70 SN=54272:FORA=SNTOSN+24:POKEA,0:NEXT:
 POKESR,6:OS=1:AO=56171:B=0:R=0             NB
•80 GOSUB2090                               FK
•90 CR$="[24"[DOWN]"]"                      KH
•100 IFPEEK(12289)<>16THENGOSUB1640:GOSUB
 850                                        NB
•110 GOSUB1580                              GL
•120 POKE53265,PEEK(53265)AND239            FC
•130 PRINT"[CLEAR][UP]":POKEPS,0:POKE4953
 1,5:POKE49532,34:POKE49533,2:POKE49534,2
 0                                          AB
•140 POKEBD,0:POKE49530,5:S=50:SG=3         OI
•150 FORSK=1TOL:RS=INT(RND(1)*720)+1:C=IN
 T(RND(1)*6)+2:POKE55376+RS,C               JB
•160 POKE1104+RS,SD                         IE
•170 NEXT:IFSD=42THENSD=46:L=20:GOTO150     JK
•180 IFSD=46THENSD=0                        FN
•190 IFSG<>1THENL=3:SG=SG-1:SD=SD+1:GOTO1
 50                                         KH
•200 GOSUB430:RN=INT(RND(1)*30)+1:POKEV+2
 1,64+RN                                    DI
•210 POKE53270,PEEK(53270)AND247:SYSW       HN
•220 SYSW                                   PH
•230 POKE V+21,127:POKE V+28,63             JG
•240 REM MAIN ROUTINE                       LL
•250 JV=PEEK(56320):FB=JVAND16:JV=15-(JVA
 ND15)                                      IC
•260 Z=PEEK(V+30):SYSW                      MC
•270 HB=INT(RND(1)*50)+1                    GM
•280 IFHB=1THENGOSUB350                     LE
•290 IFJV=8THENX=X+5:IFX>=254THENX=254      JO
•300 IFFB<>16THENPOKEV+15,178:POKEV+21,PE
 EK(V+21)OR128:GOSUB2070:GOTO1740           JL
•310 SYSW:IFJV=4THENX=X-5:IFX<=60THENX=60   GI
•320 POKEV+12,X:POKEV+14,X                  JP
•330 GOTO250                                CD
•340 REM TREMOR/HIT                         JP
•350 FORP=1TO3:FORI=1TO12:POKE53270,I:FOR
 I=1TO15:NEXT:POKE53270,8:POKESN+4,129      EG
•360 SYSW:FORT=1TO5:NEXT:SYSW:NEXT          EM
•370 POKESN+4,128:POKE53270,PEEK(53270)AN
 D247:TR=TR+1                               IA
•380 IFTR=4THENPRINTLEFT$(CR$,12)"[RVSON]
 [RIGHT][RIGHT][BLUE] [HOME]"               JB
•390 IFTR=8THENPRINTLEFT$(CR$,12)"[RVSON]
 [RIGHT][RIGHT][YELLOW] [HOME]"             DN
•400 IFTR=12THENPRINTLEFT$(CR$,12)"[RVSON
 ][RIGHT][RIGHT][RED] [HOME]"               BG
•410 IFTR>15THENTR=0:GOTO2110               PO
•420 RETURN                                 IM
•430 PRINT" [HOME][RIGHT][RVSON][c 8][8"
 "][RVSOFF] H G N M  H J N M K E [RVSON][
 8" "][RVSOFF][UP]"                         BB
•440 PRINT" [c 8][RVSON][8" "][22"[c Y]"]
 [8" "][RVSOFF]"                            CE
•450 FORI=1TO18                             MJ
•460 PRINT"[RVSON][BLACK] [RVSON][c 8][3"
 "][s V][RVSOFF][UP]"                       MH
•470 PRINTTAB(35)"[RVSON][c 8][s V][3" "]
 "                                          AE
•480 NEXT                                   IA
•490 FORI=1TO3                              IM
•500 PRINT" [RVSON][c 8][38" "]"            PJ
•510 NEXT:F=0:PRINT"[HOME]"                 BD
•520 PRINT" [UP][RVSON][RIGHT][RIGHT][s M
 ][32"[RIGHT]"][s N]"                       DD
```

```
·530 PRINT"[RVSON][4"[RIGHT]"][s M][30"[R
IGHT]"][s N][HOME]"                        HJ
·540 PRINTLEFT$(CR$,19+F)TAB(4-F)"[RVSON]
[s N]";TAB(35+F)"[s M]":F=F+1              CM
·550 IFF<>3THENPRINT"[HOME]":GOTO540       GL
·560 PRINT"[HOME][UP]"                     HO
·570 FORED=1063TO2023STEP40:POKEED,160:PO
KEED+SN,0:NEXT                             GH
·580 PRINTLEFT$(CR$,20)"[YELLOW][5"[RIGHT
]"]N I I L [RVSON][c 1][22" "][HOME]"      NM
·590 PRINTLEFT$(CR$,23)TAB(2)"[YELLOW]EFG
H[4" "]";TAB(15)"LMJHH[4" "]";TAB(28)"IF
HHJH[4" "][HOME]"                          AA
·600 POKE53265,PEEK(53265)OR16             AN
·610 RETURN                                IM
·620 REM CUSTOM CHARACTERS                 GE
·630 FORI=0TO46:READA:POKE828+I,A:CK=CK+A
:NEXT                                      MO
·640 IFCK<>6871THENPRINT"ERROR IN LINES[3
"."]":END                                  DM
·650 SYS828                                EF
·660 FORI=10240+0TO10240+175:READA:POKEI,
A:NEXT                                     JI
·670 POKE53272,(PEEK(53272)AND240)OR10:RE
TURN                                       JJ
·680 DATA120,165,1,41,251,133,1,169,0,133
,251,133,253,169,40,133,252,169,208,133    LG
·690 DATA254,162,8,160,0,177,253,145,251,
136,208,249,230,252,230,254,202,208,240    PJ
·700 DATA165,1,9,4,133,1,88,96             KC
·710 REM *** CHARACTER DATA ***            BF
·720 DATA56,124,102,227,231,126,56,48,31,
17,11,28,56,232,200,248                    EG
·730 DATA56,124,248,204,222,255,99,0,140,
222,63,63,62,204,128,0                     CK
·740 DATA 255,255,255,255,255,255,255,255 MG
·750 DATA195,195,195,255,255,243,243,243,
24,24,24,28,28,28,28,28                    DK
·760 DATA126,126,48,48,56,56,56,56,254,19
8,192,252,6,134,198,254                    PJ
·770 DATA255,255,155,219,219,219,195,195,
127,127,96,96,126,112,112,127              OH
·780 DATA127,127,99,96,112,115,115,127,12
7,103,103,99,99,99,127,127                 KJ
·790 DATA126,70,70,127,127,99,99,99,62,54
,54,127,115,115,115,115                    MD
·800 DATA254,198,198,255,255,195,195,255,
99,99,99,127,28,28,28,28                   OC
·810 DATA12,12,12,12,14,206,206,254,127,1
27,99,99,115,115,115,115                   GJ
·820 DATA127,99,99,115,115,115,115,127     PN
·830 DATA96,96,112,112,112,112,126,126,23
0,230,230,230,102,36,60,60                 FI
·840 REM *** READ SPRITE DATA ***          HC
·850 FORS1=12288TO12350:READD1:POKES1,D1:
NEXT                                       FK
·860 FORS2=12352TO12414:READD2:POKES2,D2:
NEXT                                       EP
·870 FORS3=12416TO12478:READD3:POKES3,D3:
NEXT                                       HC
·880 FORS4=12480TO12542:READD4:POKES4,D4:
NEXT                                       IL
·890 FORS5=12544TO12606:READD5:POKES5,D5:
NEXT                                       KP
·900 FORS6=12608TO12670:READD6:POKES6,D6:
NEXT                                       AJ
·910 FORS7=12672TO12734:READD7:POKES7,D7:
NEXT                                       HD
·920 FORS8=12736TO12798:READD8:POKES8,D8:
NEXT:RETURN                                GL
·930 REM STAR SPRITES                      CI
·940 DATA0,16,0,0,16,0,0,16                BD
·950 DATA0,0,084,0,1,85,0,0                LK
·960 DATA84,0,0,16,0,0,16,0                NA
·970 DATA0,16,0,0,0,0,0,0                  FI
·980 DATA0,0,0,0,0,0,0,0                   FG
·990 DATA0,0,0,0,0,0,0,0                   FG
·1000 DATA0,0,0,0,0,0,0,0                  FG
·1010 DATA0,0,0,0,0,0,0                    PD
·1020 DATA0,4,0,0,4,0,0,4                  FC
·1030 DATA0,0,21,0,0,4,0,0                 HG
·1040 DATA4,0,0,4,0,0,0,0                  EO
·1050 DATA0,0,0,0,0,0,0,0                  FG
·1060 DATA0,0,0,0,0,0,0,0                  FG
·1070 DATA0,0,0,0,0,0,0,0                  FG
·1080 DATA0,0,0,0,0,0,0,0                  FG
·1090 DATA0,0,0,0,0,0,0                    PD
·1100 DATA0,16,0,0,16,0,1,17               PD
·1110 DATA0,0,0,0,1,17,0,0                 KA
·1120 DATA16,0,0,16,0,0,0,0                OP
·1130 DATA0,0,0,0,0,0,0,0                  FG
·1140 DATA0,0,0,0,0,0,0,0                  FG
·1150 DATA0,0,0,0,0,0,0,0                  FG
·1160 DATA0,0,0,0,0,0,0,0                  FG
·1170 DATA0,0,0,0,0,0,0                    PD
·1180 DATA0,32,0,0,84,0,0,32               AC
·1190 DATA0,0,32,0,1,221,0,0               OH
·1200 DATA32,0,0,32,0,0,84,0               LC
·1210 DATA0,32,0,0,0,0,0,0                 HC
·1220 DATA0,0,0,0,0,0,0,0                  FG
·1230 DATA0,0,0,0,0,0,0,0                  FG
·1240 DATA0,0,0,0,0,0,0,0                  FG
·1250 DATA0,0,0,0,0,0,0                    PD
·1260 DATA0,16,0,0,84,0,1,17               DG
·1270 DATA0,0,84,0,0,16,0,0                JO
·1280 DATA0,0,0,0,0,0,0,0                  FG
·1290 DATA0,0,0,0,0,0,0,0                  FG
·1300 DATA0,0,0,0,0,0,0,0                  FG
·1310 DATA0,0,0,0,0,0,0,0                  FG
·1320 DATA0,0,0,0,0,0,0,0                  FG
·1330 DATA0,0,0,0,0,0,0                    PD
·1340 DATA0,16,0,0,16,0,0,16               BD
```

```
·1350 DATA0,0,84,0,1,17,0,0              OA
·1360 DATA84,0,0,16,0,0,16,0             NA
·1370 DATA0,16,0,0,0,0,0,0               FI
·1380 DATA0,0,0,0,0,0,0,0                FG
·1390 DATA0,0,0,0,0,0,0,0                FG
·1400 DATA0,0,0,0,0,0,0,0                FG
·1410 DATA0,0,0,0,0,0,0                  PD
·1420 DATA0,0,0,0,0,0,0,0                FG
·1430 DATA0,0,0,0,0,0,0,0                FG
·1440 DATA0,0,0,0,0,0,0,0                FG
·1450 DATA0,0,0,0,0,0,0,32               HO
·1460 DATA0,0,112,0,0,112,0,0            NK
·1470 DATA112,0,0,216,0,1,140,0          AK
·1480 DATA3,6,0,03,118,0,3,6             DF
·1490 DATA0,3,254,0,3,254,0              OP
·1500 DATA0,0,0,0,0,0,0,0                FG
·1510 DATA0,0,0,0,0,0,0,0                FG
·1520 DATA0,0,0,0,0,0,0,0                FG
·1530 DATA0,0,0,0,0,0,0,0                FG
·1540 DATA0,0,0,0,0,0,0,0                FG
·1550 DATA0,0,0,0,0,0,32,0               IM
·1560 DATA0,112,0,0,32,0,0,32            PC
·1570 DATA0,0,32,0,0,112,0               HO
·1580 FORI=0TO7:POKE2040+I,192+I:POKEV+39
 +I,1:NEXT                               JE
·1590 FORI=0TO11:VS(I)=INT(RND(0)*90)+70:
 NEXT                                    JP
·1600 FORI=1TO11STEP2:POKEV+I,VS(I)+OS:OS
 =OS+8:NEXT                              BH
·1610 FORI=0TO10STEP2:POKE V+I,X1:X1=X1+2
 5:NEXT                                  HL
·1620 POKE V+15,160:POKEV+14,X:POKEV+13,Y
 :POKEV+12,X                             BC
·1630 Q=INT(RND(1)*5)+1:  POKEV+37,Q:POKE
 V-38,Q:POKE53275,191:RETURN             GA
·1640 MSG$="[4" "]IFHHFLR: H G N M[3" "]H
  J N M K E"                             MN
·1650 AUT$="[12" "]OP  QFI HNRSJMH"      GG
·1660 FORI=1TOLEN(MSG$)                  GL
·1670 PRINT"[HOME][WHITE]";LEFT$(CR$,5)LE
 FT$(MSG$,I)                             BF
·1680 GOSUB2090                          FK
·1690 PRINT"[DOWN][DOWN][YELLOW]"LEFT$(AU
 T$,I)                                   CA
·1700 FORT=1TO15:NEXTT:NEXTI             ND
·1710 PRINT"[5"[DOWN]"][13"[RIGHT]"]LRJ I
 LIJRG[3"."]"                            JL
·1720 RETURN                             IM
·1730 REM FIRE GAMMA GUN                 DO
·1740 PRINT"[YELLOW][UP]":SYSW:IFRT=6THEN
 DT=20                                   NE
·1750 FORA=1TODT:Y1=Y1-RT:POKEV+15,Y1:SYS
 W:Z=PEEK(V+30):IFZ=0THENNEXT:GOTO1820   HL
·1760 G=ZAND63:POKEV+21,64+RN-G:A1=INT(A/
 2)                                      EJ
·1770 Y1=178:POKEV+15,Y1:SYSW            PO
·1780 H=H+1:R=R+1:PRINTLEFT$(CR$,23);TAB(
 9)"[LEFT]"H"[HOME]"                     GF
·1790 IFR=3ANDAO<56171THENPOKEAO,7:AO=AO+
 1:R=0:TR=TR-3:IFTR<0THENTR=0            KD
·1800 RN=INT(RND(1)*30)+1:POKEV+21,64+RN BI
·1810 Y1=178:POKEV+15,Y1:SYSW:GOTO1850   MI
·1820 POKEV+21,64+RN:MS=MS+1:SYSW:PRINTLE
 FT$(CR$,23);TAB(35)MS"[HOME]":R=0:B=B+1:
 SYSW                                    HK
·1830 IFB=1THENGOSUB1890                 MO
·1840 Y1=178:POKEV+15,Y1:SYSW            PO
·1850 XX=INT(H-MS)*10+A1:SYSW:PRINTLEFT$(
 CR$,23);TAB(22)"[3" "][UP]":SYSW:A1=0   FJ
·1860 SYSW:PRINTTAB(21)XX"[HOME]":IFXX>30
 0THEN2250                               JG
·1870 GOTO250                            CD
·1880 REM AMMO MONITOR                   OG
·1890 SYSW:AO=AO-1:POKEAO,0:B=0:IFAO=5615
 5THENFORO=56149TOAO-1:POKEO,2:NEXTO:RETU
 RN                                      KK
·1900 IFAO=56149THEN1920                 FH
·1910 RETURN                             IM
·1920 POKEV+21,0                         FF
·1930 PRINT"[CLEAR]"                     HH
·1940 MSG$="[5" "]IFHHFLR: H G N M[3" "]H
  J N M K E"                             BG
·1950 FORI=1TOLEN(MSG$)                  GL
·1960 GOSUB2090                          FK
·1970 PRINT"[HOME][WHITE]";LEFT$(CR$,5)LE
 FT$(MSG$,I)                             BF
·1980 FORT=1TO15:NEXTT:NEXTI             ND
·1990 PRINT"[YELLOW][3"[DOWN]"][11"[RIGHT
 ]"]HGNMH SJHGMLPJS";H                   GI
·2000 PRINT"[DOWN][DOWN][11"[RIGHT]"]LMJH
 H:";XX                                  OH
·2010 PRINT"[DOWN][DOWN][11"[RIGHT]"]GFIJ
 :";TI$;" KJRGLRH"                       BG
·2020 PRINT"[DOWN][DOWN][11"[RIGHT]"]NRLG
 EJM GMP  P/R"                           NB
·2030 GETAG$:IFAG$=""THEN2030            GG
·2040 IFAG$="Y"THENTR=0:PRINT"[CLEAR]":GO
 TO40                                    LG
·2050 IFAG$="N"THENSYS64738              PF
·2060 GOTO2030                           FE
·2070 POKESN+24,15:POKESN+5,97:POKESN+6,2
 0:POKESN+4,33:POKESN+1,10:POKESN,120    HI
·2080 SYSW:POKESN+4,32:RETURN            IM
·2090 POKESN+24,15:POKESN+5,97:POKESN+6,2
 0:POKESN+4,33:POKESN+1,10:POKESN,120    HI
·2100 POKESN+4,32:RETURN                 IL
·2110 POKEV+21,0:PRINT"[CLEAR]"          AP
·2120 MSG$="[4" "]IFHHFLR: H G N M[3" "]H
  J N M K E"                             MN
·2130 AUT$="[9" "]KLRSFGFLR: JMNSFKNGJS" EK
·2140 FORI=1TOLEN(MSG$)                  GL
·2150 PRINT"[HOME][WHITE]";LEFT$(CR$,5)LE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 97-99 explain these codes and provide other essential information on entering *Ahoy!* programs. Refer to these pages **before** entering any programs!

```
 FT$(MSG$,I)                                  BF
·2160 GOSUB2090                               FK
·2170 PRINT"[DOWN][DOWN][YELLOW]"LEFT$(AU
 T$,I)                                        CA
·2180 FORT=1TO15:NEXTT:NEXTI                  ND
·2190 PRINT"[DOWN][DOWN][12"[RIGHT]"]NRLG
 EJM GMP  P/R"                                FG
·2200 GETGA$:IFGA$=""THEN2200                 ED
·2210 IFGA$="Y"THENTR=0:PRINT"[CLEAR]":GO
 TO40                                         FK
·2220 IFGA$="N"THENSYS64738                   PJ
·2230 GOTO2200                                EJ
·2240 REM VICTORY R[016]INE                   AK
·2250 POKEV+21,0:PRINT"[CLEAR]"               AP
·2260 MSG$="[4" "]IFHHFLR: H G N M[3" "]H
  J N M K E"                                  MN
·2270 AUT$="[11" "]KLRSFGFLR: UFKGLMP"        FI
·2280 FORI=1TOLEN(MSG$)                       GL
·2290 PRINT"[HOME][WHITE]";LEFT$(CR$,5)LE
 FT$(MSG$,I)                                  BF
·2300 GOSUB2090                               FK
·2310 PRINT"[DOWN][DOWN][YELLOW]"LEFT$(AU
 T$,I)                                        CA
·2320 FORT=1TO15:NEXTT:NEXTI                  ND
·2330 PRINT"[DOWN][DOWN][8"[RIGHT]"]** HL
 TNM HPHGJI HNUJS **"                         HI
·2340 PRINT"[DOWN][DOWN][12"[RIGHT]"]LMJH
 H:"XX                                        OG
·2350 PRINT"[DOWN][DOWN][12"[RIGHT]"]GFIJ
 :";TI$;" KJRGLRH"                            LB
·2360 PRINT"[DOWN][DOWN][12"[RIGHT]"]NRLG
 EJM GMP  P/R"                                FG
·2370 GOTO2200                                EJ
```

ENGLISH DARTS
FROM PAGE 60

```
·100 REM: ***ENGLISH DARTS***                 JM
·105 :                                        DI
·110 REM: ***INITIALIZATION***                KL
·115 :                                        DI
·120 C$=CHR$(147):D$=CHR$(17):H$=CHR$(19)
 :F$=CHR$(144):RF$=CHR$(146):RO$=CHR$(18)     OJ
·125 C1$=CHR$(28):C2$=CHR$(30):C3$=CHR$(3
 1):C4$=CHR$(156):C5$=CHR$(158):BC=53280      ML
·130 C6$=CHR$(159):V=53248:CL=646:S=102:N
 A$="*ENGLISH DARTS*":A$="":SN$="":B$=""      LC
·135 RD=1:POKE53281,1:POKEBC,9:FORK=0TO62
 :READA:POKE832+K,A:NEXT                      MJ
·140 FORK=0TO62:READA:POKE896+K,A:NEXT:FO
 RK=49152TO49245:READA:POKEK,A:NEXT           IM
·145 POKE49152+19,0:POKE2041,13:POKE2042,
 14:POKE2043,14:POKE2044,14:SYS49152          FA
·150 :                                        DI
·155 REM: ***BILLBOARD***                     IC
·160 :                                        DI
·165 GOSUB700:GOSUB555:PRINT:PRINT:PRINTF
 $TAB(12)NA$:GOSUB680                         AI
·170 PRINTC2$RO$TAB(13)" WHICH GAME? ":PR
 INT:PRINTTAB(8)"301 "RO$" <1> ";             DO
·175 PRINTRF$" OR 501 "RO$" <2> ":PRINT       DD
·180 GETK$:K=VAL(K$):IFK<1ORK>2THEN180        CL
·185 IFK=1THENGA=301:GOTO195                  JJ
·190 GA=501                                   NI
·195 PRINTRO$TAB(7)" NUMBER OF PLAYERS? "
 RF$" (1-7)"                                  MM
·200 GETK$:Z=VAL(K$):IFZ<1ORZ>7THEN200        LK
·205 GOSUB585                                 DI
·210 :                                        DI
·215 REM: ***SCREEN PRINT***                  OJ
·220 :                                        DI
·225 POKEBC,1:PRINTH$RO$"[12" "]"NA$"[8"
 "]":REM*  -11- AND -8- SPACES                DB
·230 PRINTC5$RO$" PLAYER NUMBER "RF$PP;       DE
·235 PRINTC3$RO$TAB(20)" DART NUMBER[3" "
 ]"RF$TH                                      JP
·240 PRINTC4$RO$" ROUND SCORE[3" "]"RF$RS
 ;                                            CE
·245 PRINTC1$RO$TAB(20)" ROUND NUMBER  "R
 F$RD                                         NF
·250 PRINTC2$RO$" CURRENT SCORE "RF$TP(PP
 );                                           DD
·255 PRINTC6$RO$TAB(20)" # OF PLAYERS  "R
 F$Z:GOSUB680:FORK=1TOZ:CC=K+1:POKECL,CC      DA
·260 PRINTRO$TAB(21)" PLAYER # "RF$K;:PRI
 NTTP(K):NEXT:GOSUB680                        MF
·265 PRINTC4$TAB(1)A$:PRINT:PRINTF$TAB(7)
 SN$:PRINT:PRINTC4$TAB(4)B$:PRINT             FP
·270 IFTH>3THENGOSUB640:FORK=1TO9:POKEV+K
 ,0:NEXT:GOSUB585:GOTO225                     PJ
·275 POKE198,0:GOSUB640:PRINTC5$"PRESS "R
 O$F$"<KEY>"RF$C5$" TO TOSS"                  CI
·280 :                                        DI
·285 REM: ***THROW SEQUENCE***                NO
·290 :                                        DI
·295 FORK=1664TO1683:POKEK,32:NEXT:FORK=1
 744TO1763:POKEK,32:NEXT                      AG
·300 FORK=1824TO1843:POKEK,32:NEXT:IFTH=1
 THENQ=4:W=5:Y=215:G=6:GOTO315                DO
·305 IFTH=2THENQ=6:W=7:Y=211:G=14:GOTO315     IC
·310 IFTH=3THENQ=8:W=9:Y=219:G=30             NG
·315 POKEV+21,G:POKEV+23,2:POKEV+29,28:FO
 RK=1TOZ:IFK=PPTHENCC=K+1:GOTO325             JO
·320 NEXT                                     IA
·325 POKEV+40,11:FORK=41TO43:POKEV+K,CC:N
 EXT:POKEV+2,255:POKEV+3,90                   KE
·330 FORL=90TO110:POKEV+Q,30:POKEV+W,L:IF
 PEEK(198)=1THEN350                           BN
·335 FORT=1TO10:NEXTT:NEXTL                   PH
·340 FORL=110TO90STEP-1:POKEV+Q,30:POKEV+
```

```
W,L:IFPEEK(198)=1THEN350                      IG
·345 FORT=1TO10:NEXTT:NEXTL:GOTO330           GC
·350 FORK=1904TO1923:POKEK,32:NEXT:POKEV+
Q,0:POKEV+W,0:POKE198,0:POKEV+21,G            NO
·355 FORK=30TOY:POKEV+Q,K:POKEV+W,L:NEXT:
GOSUB660:R=N:GOSUB660:D=N                     IF
·360 A=0:FORK=80TO99:A=A+1:IFL=KTHEN380       LD
·365 NEXT                                     IA
·370 A=21:FORK=101TO110:A=A-2:IFL=KTHEN38
0                                             LB
·375 NEXT:IFL=100THENA=50                     NP
·380 IFA=50THENB=A:A$="YOU THREW A[3"."]"
:SN$="BULLSEYE!":GOTO405                      HC
·385 IFA=RANDA=DTHENB=A*3:A$="YOU THREW A
 TRIPLE":GOTO400                              BL
·390 IFA=RTHENB=A*2:A$="YOU THREW A DOUBL
E":GOTO400                                    JP
·395 B=A:A$="YOU THREW A SINGLE"              IG
·400 SN$=STR$(A)                              NC
·405 B$="FOR"+STR$(B)+" POINTS":TP(PP)=TP
(PP)+B:RS=RS+B                                PJ
·410 IFTP(PP)=GATHENFORK=1TO9:POKEV+K,0:N
EXT:GOTO475                                   GP
·415 IFTP(PP)>GATHENFORK=1TO9:POKEV+K,0:N
EXT:GOTO440                                   HO
·420 TH=TH+1:GOTO225                          DG
·425 :                                        DI
·430 REM: ***BROKE STATEMENT***               KH
·435 :                                        DI
·440 POKEBC,2:GOSUB700:GOSUB555:GOSUB680      PG
·445 PRINTC4$TAB(14)"YOU THREW"B:PRINT:PR
INTTAB(18)"AND":PRINT                         OL
·450 PRINTF$TAB(14)"B*R*O*K*E!!":PRINTC4$
:GOSUB640:TP(PP)=TP(PP)-B                     CH
·455 RS=0:TH=1:GOSUB585:FORK=1TO9:POKEV+K
,0:NEXT:GOTO225                               BA
·460 :                                        DI
·465 REM: ***WINNER STATEMENT***              HK
·470 :                                        DI
·475 POKEBC,5:GOSUB700:GOSUB555:GOSUB680:
PRINTC4$TAB(5)NA$" WINNER IS[3"."]"           LB
·480 PRINT:GOSUB640:PRINTF$TAB(10)"PLAYER
 NUMBER"PP:PRINT                              AA
·485 PRINT:PRINTC4$TAB(8)"SEE FINAL SCORE
S? (Y/N)"                                     CC
·490 GETK$:IFK$=""THEN490                     HM
·495 IFK$="Y"THENPP=Z:NU=1:GOTO585            ND
·500 IFK$="N"THEN515                          IB
·505 IFK$<>"Y"ORK$<>"N"THEN490                FF
·510 GOSUB680                                 CO
·515 PRINT:PRINTC5$RO$TAB(10)" PLAY AGAIN
? "RF$" (Y/N)"                                NJ
·520 GETK$:IFK$=""THEN520                     GO
·525 IFK$="Y"THENCLR:GOTO120                  PI
·530 PRINTC$:GOSUB680:PRINTC2$TAB(12)NA$:
PRINT:PRINTTAB(17)"E*N*D":GOSUB640            JE
·535 POKEV+21,0:PRINTC$:END                   FK
·540 :                                        DI
·545 REM: ***SPRITE LOGO***                   MJ
·550 :                                        DI
·555 POKEV+21,30:POKEV+23,2:POKEV+29,28:P
OKEV+40,12:POKEV+41,11:POKEV+42,12            OO
·560 POKEV+43,15:POKEV+2,180:POKEV+3,100:
POKEV+4,144:POKEV+5,104:POKEV+6,147           MJ
·565 POKEV+7,111:POKEV+8,142:POKEV+9,118:
RETURN                                        FE
·570 :                                        DI
·575 REM: ***NEXT PLAYER/BOX SCORE SUBROU
TINE***                                       AL
·580 :                                        DI
·585 POKEBC,5:GOSUB700:GOSUB555:TH=1:RS=0
:PP=PP+1:IFPP>ZTHEN600                        DI
·590 GOSUB680:PRINTC2$TAB(8)"PLAYER NUMBE
R"F$PP;:PRINTC2$"UP NEXT":GOSUB640            FI
·595 FORK=1TO9:POKEV+K,0:NEXT:A$="":SN$="
":B$="":PRINTC$:RETURN                        NL
·600 PRINT:PRINT:PRINTC2$RO$TAB(4)" PLAYE
R NUMBER "TAB(25)" POINTS ":PRINT:PRINT       KM
·605 FORK=1TOZ:CC=K+1:POKECL,CC:PRINTTAB(
10)K;:PRINTTAB(26)TP(K):PRINT:NEXT            FM
·610 PRINTH$:FORK=1TO22:PRINTD$;:NEXT:PRI
NTC4$RO$TAB(12)" PRESS ANY KEY "              IN
·615 POKE198,0:WAIT198,1:POKE198,0:RD=RD+
1:PP=0:IFNU=1THENGOSUB700:GOTO510             LP
·620 GOTO585                                  DE
·625 :                                        DI
·630 REM: ***TIME DELAY SUBROUTINE***         NO
·635 :                                        DI
·640 FORT=1TO1500:NEXT:RETURN                 ME
·645 :                                        DI
·650 REM: ***RANDOM SUBROUTINE***             KH
·655 :                                        DI
·660 N=INT(20*RND(0))+1:RETURN                BA
·665 :                                        DI
·670 REM: ***CENTER SUBROUTINE***             ND
·675 :                                        DI
·680 PRINTH$:FORK=1TO15:PRINTD$;:NEXT:RET
URN                                           CN
·685 :                                        DI
·690 REM: ***BORDER SUBROUTINE***             KI
·695 :                                        DI
·700 PRINTC$:POKECL,7:FORK=1024TO1063:POK
EK,S:NEXT:FORK=1024TO1984STEP40:POKEK,S       FO
·705 NEXT:FORK=1063TO2023STEP40:POKEK,S:N
EXT:FORK=1984TO2023:POKEK,S:NEXT:RETURN       EN
·710 :                                        DI
·715 REM: ***DATA***                          PI
·720 :                                        DI
·725 DATA0,16,0,0,56,0,0,85                   AJ
·730 DATA0,0,146,0,1,17,0,2                   CC
·735 DATA56,128,5,85,64,8,146,32              CC
·740 DATA17,85,16,34,56,136,127,255           AK
```

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```
•745 DATA252,34,56,136,17,85,16,8          BI
•750 DATA146,32,5,85,64,2,56,128           EO
•755 DATA1,17,0,0,146,0,0,84               GO
•760 DATA0,0,56,0,0,16,0,0                 OL
•765 DATA0,0,0,0,0,0,0,0                   FG
•770 DATA0,0,0,0,0,0,0,0                   FG
•775 DATA0,0,0,0,240,0,0,127               FE
•780 DATA0,0,63,254,0,31,255,255           FM
•785 DATA63,254,0,127,0,0,254,0            DN
•790 DATA0,0,0,0,0,0,0,0                   FG
•795 DATA0,0,0,0,0,0,0,0                   FG
•800 DATA0,0,0,0,0,0,173,21                DG
•805 DATA192,141,22,192,120,169,24,141     EM
•810 DATA20,3,169,192,141,21,3,88          JK
•815 DATA96,5,0,20,0,0,206,22              IP
•820 DATA192,208,61,173,21,192,141,22      PI
•825 DATA192,173,33,208,41,15,141,20       AM
•830 DATA192,160,0,132,251,169,216,133     BI
•835 DATA252,238,23,192,173,23,192,41      KB
•840 DATA1,170,177,251,41,15,205,19        KC
•845 DATA192,240,5,205,20,192,208,5        MB
•850 DATA189,19,192,145,251,200,208,234    IF
•855 DATA230,252,165,252,201,220,208,226   PM
•860 DATA76,49,234,52                      ON
```

SKI FOLLY
FROM PAGE 67

```
•10 PRINT"[CLEAR]":POKE53281,1:POKE53280,
 1:POKE52,60:POKE56,60                     BO
•20 DATA 120,169,73,141,20,3,169,3,141     FA
•30 DATA 21,3,88,96,169,208,133,252,169    LD
•40 DATA 3,133,251,162,1,160,0,177,251     FN
•50 DATA 105,1,144,2,169,251,145,251,224   NC
•60 DATA 7,240,8,232,230,251,230,251,24    NO
•70 DATA 144,234,173,1,220,41,15,201       LK
•80 DATA 11,240,7,201,7,240,16,76,49,234,
 173,0,208,201,32,240,246,206,0,208        OK
•90 DATA 24,144,240,173,0,208,201,255,240
 ,233,238,0,208,24,144,227,0,0,0,0,0       EA
•100 FORU=828TO921:READQ:POKEU,Q:NEXT      IO
•110 SYS 828:POKE53248+21,0:VIC=53248      IA
•120 GOSUB600                              CG
•130 GOSUB1260                             FK
•140 POKE856,2                             JC
•150 X5=RND(-SQR(RND(1)*TI))               FL
•160 S=53248:PRINT"[CLEAR][BLACK]          CK
•170 POKE53281,3                           AG
•180 FORU=1024TO1063:POKEU,160:POKEU+960,
 160                                       HA
•190 POKE54272+U,6:POKE54272+U+960,6:NEXT KK
•200 FORU=1024TO1984 STEP40:POKEU,160:POK
 EU+33,160:POKEU+39,160                    HJ
•210 POKEU+54272,14:POKE54272+U+33,14:POK
 E54272+U+39,14:NEXT                       JO
•220 POKE53281,1                           AE
•230 FORU=0TO14STEP2:POKEU+VIC,(U*18):NEX
 T                                         MN
•240 POKE2040,203                          CI
•250 POKEVIC+28,34:POKEVIC+37,5:POKEVIC+3
 8,5                                       BP
•260 FORU=40TO47:POKEVIC+U,5:NEXT          KL
•270 POKEVIC+21,255                        GN
•280 FORI=1TO7:POKE2040+I,202:NEXT         MN
•290 DI=254                                NI
•300 X=150:DI=0                            ED
•310 POKEVIC,X:TI$="[6"0"]":A$(2)="FAST[6
 " "]"                                     LB
•320 A$(3)="REAL FAST ":A$(4)="VERY FAST!
  "                                        CK
•330 A1=PEEK(VIC+30):FORI=0TO24:POKE54272
 +I,0:NEXT                                 LM
•340 POKE54296,15:POKE54273,0:POKE54277,8
 5:POKE54278,85:POKE54276,129              GJ
•350 A$(1)="WHOA[6"!"]":G=2:A$(5)="TOO FA
 ST !                                      MH
•360 I=0:A=INT(RND(1)*7)+1:IFPEEK(VIC+(A*
 2)+1)>240THENI=1                          EK
•370 A1=PEEK(VIC+30)AND1:IFA1THEN1790      OG
•380 IFBR=0THENPOKE856,G                   HA
•390 IFBR=0THENIF(PEEK(56321)AND16)=0THEN
 POKE856,1:BR=1:GOSUB2280                  KD
•400 IFBRTHENDI=DI-1                       GP
•410 IFBRTHENIF(PEEK(56321)AND16)=16THENP
 OKE856,G:BR=0:POKE54276,129:GOSUB2310     ML
•420 DI=DI+1:PRINT"[RVSON][HOME][RIGHT]EN
 D OF SLOPE:[4" "][4"[LEFT]"]"400-DI"[LEF
 T] FT.";:IFDI=>400THEN1520                OE
•430 IFTI$="[4"0"]11"THENG=3               CP
•440 IFTI$="[4"0"]49"THENG=4               BJ
•450 PRINTTAB(20);"[RVSON][RIGHT]SPEED:";
 A$(PEEK(856));                            CN
•460 PRINT"[HOME][DOWN][DOWN]"TAB(34)"TIM
 E:                                        PI
•470 PRINT"[DOWN]"TAB(33);"[RVSON]"TI$"    ND
•480 POKE54272,G*30+20                     DF
•490 IFTI$="[5"0"]9"THENPRINT"[HOME][4"[D
 OWN]"]"TAB(8);"SLOPE STEEPENING!          BF
•500 IFTI$="[4"0"]47"THENPRINT"[HOME][4"[
 DOWN]"]"TAB(8);"SLOPE STEEPENING!         LF
•510 IFTI$="[4"0"]12"THENPRINT"[HOME][4"[
 DOWN]"]"TAB(8);"[17" "]"                  IB
•520 IFTI$="[4"0"]50"THENPRINT"[HOME][4"[
 DOWN]"]"TAB(8);"[17" "]"                  MH
•530 IFI=0THENGOTO360                      IJ
•540 POKE2040+A,202                        AN
•550 POKEVIC+(A*2)+1,0                     OM
•560 A1=PEEK(VIC+30)AND1:IFA1THEN1790      OG
•570 POKE54272,PEEK(856)*12                KP
•580 GOTO360                               CJ
```

```
·590 REM ---- OPENING SCREEN ----        IJ
·600 PRINT"[CLEAR]                       FH
·610 DATA 0,0,0,0,0,0,0,0                GK
·620 DATA 0,63,198,3,127,230,3,192       BE
·630 DATA 6,24,192,6,48,192,6,99         FH
·640 DATA 255,230,195,127,247,131,0,55   PG
·650 DATA 3,0,55,3,0,55,131,0            PB
·660 DATA 54,195,0,54,99,127,230,51      FP
·670 DATA 255,198,27,0,0,0,0,0           OJ
·680 DATA 0,0,0,0,0,0,0,0                GK
·690 DATA 0,0,0,0,0,0,0,0                GK
·700 DATA 0,255,198,192,255,198,192,192  JN
·710 DATA 6,192,192,6,192,192,6,192      FP
·720 DATA 254,6,192,254,6,192,192,198    JI
·730 DATA 211,193,230,211,195,54,211,194 NB
·740 DATA 22,211,195,54,211,193,230,211  GD
·750 DATA 192,198,207,0,0,3,0,0          DL
·760 DATA 3,255,255,254,127,255,252,0    EJ
·770 I=200:GOSUB780:GOTO790              GJ
·780 FORU=I*64TOI*64+63:READQ:POKEU,Q:NEX
 T:RETURN                                GN
·790 I=201:GOSUB780                      AK
·800 POKE2040.200:POKE2041.200:POKE2042.2
 01:VIC=53248                            FK
·810 POKEVIC+21,6:POKEVIC+29,7:POKEVIC+23
 ,7                                      JA
·820 POKEVIC+2,136:POKEVIC+4,188         PN
·830 POKEVIC+41,14:POKEVIC+40,14         LD
·840 POKEVIC+3,0:POKEVIC+5,0             LG
·850 S=54272:POKES+24,15:POKES+5,85:POKES
 +6,85:POKES+12,85:POKES+13,86           MA
·860 POKES+4,33:POKES+11,17              PN
·870 IFPEEK(VIC+3)=>127THENPOKEVIC+1,PEEK
 (VIC+3):GOTO900                         GE
·880 POKES+1,128-PEEK(VIC+3):POKES+8,128-
 PEEK(VIC+5)                             NE
·890 GOTO870                             CP
·900 POKEVIC,PEEK(VIC+2):POKEVIC+21,5:POK
 EVIC+1,127:POKEVIC+39,6                 JF
·910 IFPEEK(VIC+5)>=127THEN940           OM
·920 POKES+8,128-PEEK(VIC+5)             FO
·930 GOTO910                             CK
·940 POKE856,0:POKEVIC+41,6:POKEVIC+5,127 EH
·950 POKES+24,0                          FL
·960 FORU=0TO5:FORE=0TO14:POKEVIC+39,E:PO
 KEVIC+41,E:NEXTE,U:GOSUB1080            LB
·970 POKE53254,171:POKE53255,200:POKE5325
 7,100:POKE53256,171:POKE2044,204        BE
·980 POKE2043,203:POKEVIC+21,13+16       CF
·990 POKEVIC+42,12:POKEVIC+43,10         KB
·1000 POKE198,0:FORDL=1TO400:NEXT        ML
·1010 SB=1024:CB=SB+54272:FORI=10TO29:POK
 ESB+I+160,160:POKECB+I+160,6            MP
·1020 POKESB+I+880,160:POKECB+I+880,6:NEX
 T:FORI=4TO22:W=I*40:POKESB+W+10,160     OF
·1030 POKECB+W+10,6:POKESB+W+29,160:POKEC
 B+W+29,6:NEXT                           HC
·1040 PRINT"[15"[DOWN]"][15"[RIGHT]"][BLA
 CK]PRESS [RVSON]FIRE[c 7]               DC
·1050 GETA$:IFA$=""THEN1050              KC
·1060 POKEVIC+21,0:FORU=0TO14:POKEU+VIC,0
 :NEXT                                   LA
·1070 POKEVIC+23,0:POKEVIC+29,0:PRINT"[CL
 EAR]":POKE53280,0:RETURN                KO
·1080 FORI=202*64TO204*64+62             KN
·1090 READQ:POKEI,Q:NEXT:RETURN          AK
·1100 DATA 0,16,0,0,40,0,0,84,0          GA
·1110 DATA 0,170,0,1,85,0,2,170,128      BC
·1120 DATA 5,85,64,2,170,128,5,85,64     IE
·1130 DATA 10,170,160,21,85,80,10,170,160 GI
·1140 DATA 21,85,80,42,170,168,0,56,0    AM
·1150 DATA 0,56,0,0,56,0,5,85,64         IF
·1160 DATA 42,128,168,0,0,0,0,0,0        MK
·1170 DATA 0,0,62,0,0,127,0,0,127        LG
·1180 DATA 0,2,62,0,4,28,0,24            AI
·1190 DATA 127,128,24,255,192,45,190,96  LC
·1200 DATA 71,62,48,130,62,80,0,62       DI
·1210 DATA 56,0,190,16,4,118,8,6         NF
·1220 DATA 54,4,3,54,2,1,182,0           EF
·1230 DATA 0,230,0,0,99,0,0,49           FG
·1240 DATA 128,0,24,192,0,0,0,0          IO
·1250 RETURN                             IM
·1260 REM ---- INSTRUCTIONS ----         AG
·1270 PRINT"[c 7][CLEAR]":A1=PEEK(56321)A
 ND16:IFA1=0THEN1260                     CA
·1280 POKE856,0                          JA
·1290 POKEVIC+23,0:POKEV+29,0            HK
·1300 POKE53281,6:FORI=12TO27:POKE1064+I,
 160:POKE1064+I+160,160:NEXT             KK
·1310 FORI=1064TO1064+160STEP40:POKEI+12,
 160:POKEI+27,160:NEXT                   AA
·1320 PRINT"[DOWN]"TAB(14);"[c 8][12"[c @
 ]"]":PRINTTAB(14);"[RVSON]INSTRUCTIONS" JB
·1330 PRINT"[6"[DOWN]"][c 7]  [YELLOW]YOU
 'RE ON A SKI VACATION AT THE MT.        AL
·1340 PRINT"  KENDALL SKI LODGE.  YOU FIN
 D THAT YOU                              FN
·1350 PRINT"  HAVE ACCIDENTALLY GOTTEN ON
 "CHR$(34)"DEAD                          KK
·1360 PRINT"  MAN'S SLOPE"CHR$(34)"[4"!"]
   YOU MUST USE                          KK
·1370 PRINT"  YOUR LIMITED SKIING ABILITI
 ES TO                                   JN
·1380 PRINT"  SAVE YOUR LIFE !           AM
·1390 PRINT"  [3"[DOWN]"][7"[RIGHT]"][RVS
 ON][WHITE]THIS IS YOU:[RVSOFF]"         DF
·1400 PRINTTAB(22);"[UP][c @][c @][s M]  NF
·1410 PRINTTAB(22);"[c T][c T][s N]":VIC=
 53248                                   HE
·1420 POKEVIC+5,104:POKEVIC+4,170:POKE204
 2,202:POKEVIC+41,0                      AJ
·1430 POKEVIC+21,5:POKE2040,203          IO
```

```
•1440 POKEVIC,235:POKEVIC+1,200                HG
•1450 PRINT"[c 8][DOWN][10"[RIGHT]"]PRESS
 -[WHITE][RVSON]FIRE[RVSOFF][c 8]- TO ST
 ART                                            EJ
•1460 SB=1024:CB=54272+SB:FORI=0TO39:POKE
 SB+I,160:POKECB+I,7                            AI
•1470 POKESB+I+960,160:POKECB+I+960,7:NEX
 T                                              CF
•1480 FORI=0TO960STEP40                         CL
•1490 POKESB+I,160:POKECB+I,7:POKESB+I+39
 ,160:POKECB+I+39,7:NEXT                        MH
•1500 A=PEEK(56321)AND16:IFATHEN1500            FK
•1510 PRINT"[CLEAR]":POKEVIC+21,0:RETURN        HF
•1520 REM  ----  YOU MADE IT  ----              PO
•1530 POKEVIC+11,0:POKE2045,204                 GE
•1540 T$=TI$                                    PL
•1550 POKEVIC+21,252                            GA
•1560 IFPEEK(VIC+5)=<50THEN1560                 HM
•1570 SP=53251:FORU=1TO7                        EO
•1580 IFU=5THEN1600                             DJ
•1590 POKESP,0                                  KG
•1600 SP=SP+2:NEXT                              JG
•1610 IFPEEK(VIC+11)=<150THEN1610               LL
•1620 POKE856,2                                 JC
•1630 IFPEEK(VIC+11)=<179THEN1630               PE
•1640 POKE856,0                                 JA
•1650 PRINT"[HOME][4"[DOWN]"]"TAB(9);"YOU
  MADE IT !                                     AC
•1660 H1(1)=25:L1(1)=30:H2(1)=18:L2(1)=20
 9                                              KP
•1670 H1(2)=33:L1(2)=135:H2(2)=25:L2(2)=3
 0                                              HC
•1680 H1(3)=42:L1(3)=62:H2(3)=31:L2(3)=16
 5                                              OP
•1690 H1(4)=50:L1(4)=60:H2(4)=37:L2(4)=16
 2                                              LJ
•1700 H1(5)=42:L1(5)=62:H2(5)=31:L2(5)=16
 5                                              LD
•1710 H1(6)=50:L1(6)=60:H2(6)=37:L2(6)=16
 2                                              LF
•1720 S=54272:POKES+5,85:POKES+6,85:POKES
 +12,85:POKES+13,85                             OP
•1730 POKES+24,15:POKES+4,33:POKES+11,17        JO
•1740 FORX=1TO6:POKES,L1(X):POKES+1,H1(X)
 :POKES+7,L2(X):POKES+8,H2(X)                   HH
•1750 IFH1(X)=50THENFORT=1TO200:NEXT            PG
•1760 FORT=1TO200:NEXT:NEXTX                    LM
•1770 FORD=0TO24:POKES+D,0:NEXT                 ME
•1780 GOTO1920                                  FJ
•1790 REM  ----  YOU CRASHED!  ----             PC
•1800 POKE856,0:S=54272:POKES,240:POKES+1
 ,33:POKES+5,8:POKES+22,104:POKES+23,1          HI
•1810 POKES+24,79                               JH
•1820 POKES+4,129:FORDL=1TO100:NEXT:POKES
 +4,128                                         DI
•1830 POKE856,1                                 JD
•1840 FORI=200TO251:POKE53249,I:NEXT            FD
•1850 POKE856,1:T$=TI$:POKES+4,0                EJ
•1860 FORY=32TO50:POKE2040,Y:NEXT               MM
•1870 POKEVIC+21,254                            GO
•1880 S=54272:POKES+24,15:POKES+5,85:POKE
 S+1,1:POKES+4,17                               JE
•1890 FORDL=1TO200:NEXT:POKES+4,16:FORDL=
 1TO200:NEXT:POKES+4,0                          NL
•1900 PRINT"[HOME][4"[DOWN]"]"TAB(8);"[4"
  "]YOU CRASHED! "                              NK
•1910 POKE54276,0                               PI
•1920 PRINT"[DOWN][DOWN]"TAB(13)"GAME OVE
 R!":PRINT"[DOWN][DOWN]"TAB(13)"PRESS [RV
 SON]FIRE[RVSOFF]                               LL
•1930 POKES+4,0:POKES+4,33:POKES+5,85:POK
 ES+24,15                                       MB
•1940 A1=PEEK(56321)AND16:POKE53280,RND(1
 )*16                                           FD
•1950 SC=ABS(INT(((300-VAL(T$))*DI)/2)):I
 FDI=400THENSC=SC+500                           DF
•1960 A=INT(RND(1)*7)+1:IFPEEK(VIC+(A*2)+
 1)=251THENPOKEVIC+(A*2)+1,0                    EH
•1970 IFA1THEN1940                              HN
•1980 POKE56321,0:POKE53280,0                   CL
•1990 POKES+24,0                                FL
•2000 POKE53281,14                              EB
•2010 POKEVIC+21,0                              PM
•2020 A1=PEEK(56321)AND16:IFA1=0THEN2020        HC
•2030 PRINT"[CLEAR][6"[DOWN]"][11" "][WHI
 TE]YOUR SCORE:"SC                              PK
•2040 IFSC=>HSTHENHS=SC                         LB
•2050 PRINT"[BLUE][DOWN][DOWN][11" "]BEST
  SCORE:"HS                                     CC
•2060 PRINT"[DOWN][DOWN][4"[RIGHT]"][BLUE
 ][7" "]WOULD YOU LIKE TO                       DN
•2070 PRINT"[DOWN][4"[RIGHT]"][11" "]PLAY
  AGAIN?                                        BC
•2080 PRINT"[DOWN][WHITE][RIGHT][RIGHT][1
 4" "][RIGHT]Y / N                              AH
•2090 PRINT"[HOME][18"[DOWN]"][14"[RIGHT]
 "][CYAN]  [RVSON] [YELLOW][RVSOFF][UPARR
 OW][RVSON][CYAN][3" "][YELLOW] [CYAN] [R
 VSOFF]                                         CG
•2100 A4=1761:A5=1765                           CA
•2110 A=A4                                      GL
•2120 A1=PEEK(56321)AND15                       FL
•2130 IFA1=11THENA=A4                           CB
•2140 IFA1=7THENA=A5                            PI
•2150 POKEA4,32:POKEA5,32:POKEA,30              EN
•2160 A1=PEEK(56321)AND16:IFA1THEN2120          AA
•2170 IFA=A4THEN130                             CG
•2180 POKE198,0:FORI=1TO30:PRINT"[DOWN][W
 HITE]";:NEXT                                   NG
•2190 END                                       IC
•2200 DATA 0,0,56,0,0,248,0,1                   NE
•2210 DATA 248,0,3,240,0,7,224,0                PB
```

```
·2220 DATA 15,224,0,31,192,0,63,192       HE
·2230 DATA 0,63,128,0,127,0,0,127         GM
·2240 DATA 0,0,254,0,0,252,0,0            GC
·2250 DATA 124,0,0,112,0,0,0,0            AB
·2260 DATA 1,192,0,3,224,0,3,224          IE
·2270 DATA 0,3,224,0,1,192,0,0            EK
·2280 POKE54276,0:POKE54277,144:POKE54276
 ,33:POKE54276,32:POKE54278,144           HP
·2290 POKE54273,20                        DM
·2300 RETURN                              IM
·2310 POKE54276,0:POKE54276,129           EF
·2320 POKE54273,0:POKE54277,85            IF
·2330 RETURN                              IM
```

SCUTTLEBUTT

Continued from page 14

Apple II+ compatible non-decoded 8-bit peripheral slot.

The system enables your 1541 or 2030 disk drive to read and write all standard Apple II+ media. You can automatically or manually select C-64 or Apple II+ formats while reading or writing.

Of open architecture design, the Spartan has 64K and a 6502A, 1 MHz processor, and is upgradable to 65816 (16 bit).

Other features include an Apple II+ switching power supply, shared resource capabilities, automatic or manual video and audio switching, mixed video capabilities, compatibility with standard audio cassette decks, and user-assignable system commands and coprocessing capabilities.

For all its many features, we don't expect the Spartan to found an empire. Two and a half years ago, when C-64 software was still relatively scarce, Mimic might have found many takers for a device that provided access to the thousands of Apple programs on the market. But we all know what happened in the two and a half years since then. Still, *Ahoy!* will provide a detailed review of this long-awaited product soon after we receive our evaluation unit.

Mimic Systems (see address list, this page).

COMPANIES MENTIONED IN SCUTTLEBUTT

Aegis Development
2210 Wilshire Blvd.,
Suite 277
Santa Monica, CA 90403
Phone: 213-306-0735

Batteries Included
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Richmond Hill, Ontario
L4B 1B5 Canada
Phone: 416-881-9941

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1350 South Leavitt Street
Chicago, IL 60608
Phone: 312-733-6400

Commodore-Amiga, Inc.
Commodore International
1200 Wilson Drive
West Chester, PA 19380

Compusoft Publishing
535 Broadway
El Cajon, CA
92021-5463
Phone: 619-588-0996

Cygnus
P.O. Box 57825
Webster, TX 77598
Phone: 713-486-4163

Digital Vision, Inc.
14 Oak Street—Suite 2
Needham, MA 02192
Phone: 617-444-9040

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2755 Campus Drive
San Mateo, CA 94403
Phone: 415-571-7171

Fuji Photo Film U.S.A.
350 Fifth Avenue
New York, NY 10118
Phone: 212-736-3335

HPBooks
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Tucson, AZ 85704
Phone: 800-528-4923

ICCCI
1801 Stevens Drive
Iowa City, IA 52240
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2525 SW 224th Ave.
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Aloha, OR 97007
Phone: 503-649-3765

Lattice, Incorporated
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Glen Ellyn, IL 60138
Phone: 312-858-7950

MasterSoft
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Bend, OR 97709
Phone: 503-388-7654

Mavenware
P.O. Box 3643
Juneau, AK 99803
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MicroComputer Accessories
5721 Buckingham Parkway
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Culver City, CA 90231
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P.O. Box 1131
Konosha, WI 53141
Phone: 414-694-4400

Poseidon Electronics
103 Waverly Place
New York, NY 10011
Phone: 212-777-9515

Quantum Computer Services
8620 Westwood Center Dr.
Vienna, VA 22180
Phone: 703-448-8700

Soniture, Incorporated
480 Vandell Way
Campbell, CA 95008
Phone: 408-866-4616

Sportsware
5234 War Wagon Drive
San Jose, CA 95136
Phone: 415-960-6674

Strategic Simulations Inc.
883 Stierlin Road, Bldg.
A-200
Mountain View, CA
94043-1983
Phone: 415-964-1353

Tidal Bore Software
230 Pleasant Street
Truro, NS
Canada B2N 3S8
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271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300

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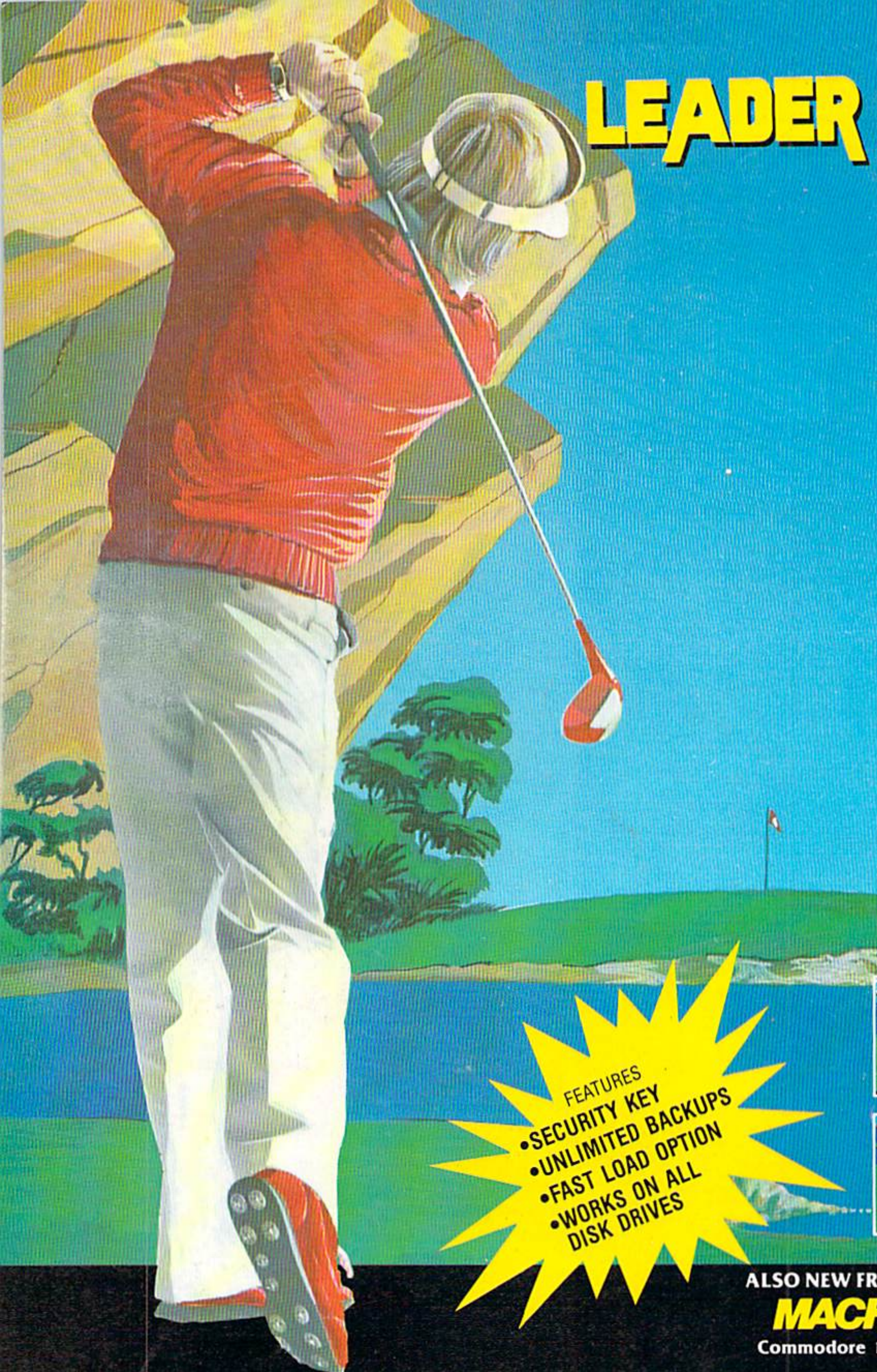
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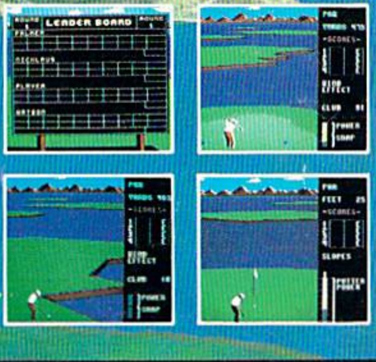
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